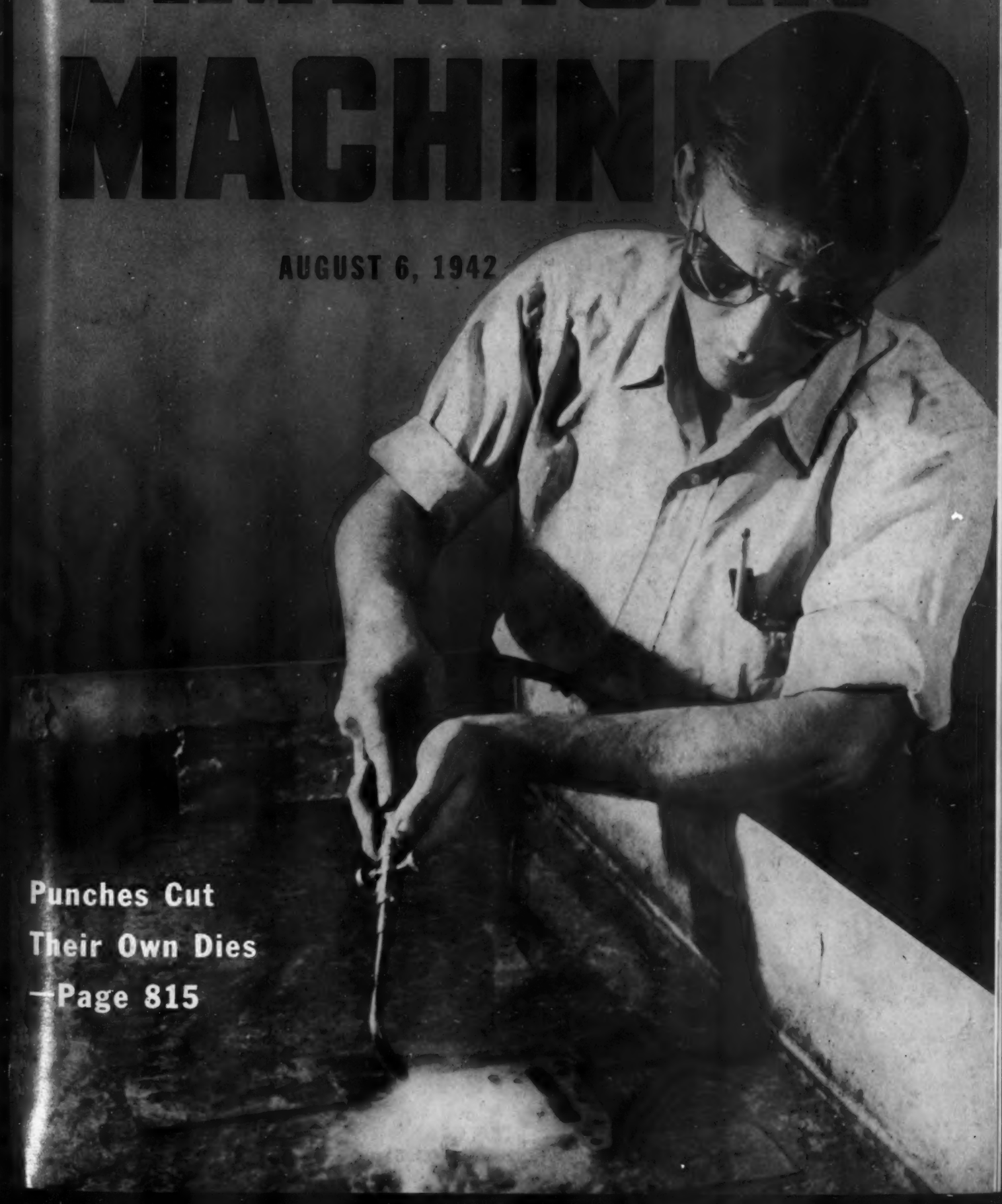
AMERICAN MACHINIST

AUGUST 6, 1942



Punches Cut Their Own Dies —Page 815

Heald Service Starts Here

Shown above is one aisle of many in our fireproof vault where invaluable engineering records are filed.

Some idea of our engineering capacity and production can be obtained from the Printing Department where on an average every day in the year 4300 square feet of blueprints roll out from the Pease No. 22, while the Ozalid Black & White machine produces 4650 square feet every 24 hours.

The 250,000 drawings carefully filed in Heald vaults represent a tremendous amount of engineering knowledge accumulated through many years in serving industry in precision finishing. Found in these drawings is a quick answer to all kinds of problems in precision grinding and boring . . . in the wealth of machine design developed to meet ever-changing finishing requirements . . . in the special machine details that have solved countless special problems . . . in the hundreds of fixtures designed for quicker and more efficient chucking . . . in the infinite variety of tool applications. Today, this backlog of engineering data has become a source of service tremendously valuable in keeping production rolling . . . for these 250,000 drawings as interpreted by 250 Heald Engineers form an encyclopedia of production know-how immediately available for helping all our customers solve every kind of problem involving precision internal grinding, surface grinding and precision boring.

THE HEALD MACHINE CO. WORCESTER, MASS. U. S. A.

AMERICAN MACHINIST

August 6, 1942

Hot Punch—Flame-hardened punches and dies make low-cost blanking tools for use on sheet-steel aircraft parts

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VOLUME 86 — NUMBER 16

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PRINTED IN U. S. A.

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CURRENTLY IN THE MAIL TO AMERICAN MACHINIST . . .

". . . many valuable suggestions, hints and interesting articles in American Machinist have been read and appreciated and either immediately applied or stored up for future reference.

". . . we are in the process of constructing additional space for our war work under supervision of the Navy. For this we have purchased a quantity of machinery amounting to thousands of dollars—approximately 20 new machines . . . we have been much influenced by American Machinist in our purchases, as practically all of these machines and machine tools have been advertised in your pages."

General Manager, New England firm whose peacetime work was making power plant equipment

Another Example of How AMERICAN MACHINIST, with Each Issue Packed Full of Helpful Editorial and Advertising, is Serving the Wartime Needs of Metal-Working Production Executives Today

TEETH OF BEVEL AND HYPOID GEARS PRECISION GROUND ON THIS

New Gleason

No. 17 HYPOID GRINDER

FOR GENERATED GEARS AND PINIONS

With the new Gleason No. 17 Grinder, the teeth of hardened curved-tooth bevel and hypoid gears and pinions are now finished by precision grinding many times faster than possible by cutting.

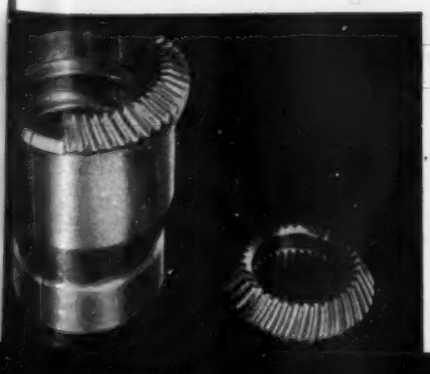
Send prints for complete information on grinding your bevel gears.

ADVANTAGES OF GROUND BEVEL GEARS

Heat-treat distortion corrected . . . all teeth made uniform . . . surface irregularities eliminated . . . tool marks removed . . . tooth profile and fillet blended smoothly into bottom land . . . RESULT—SMOOTHER, QUIETER, LONGER-LIVED GEARS.

SPECIFICATIONS

Cone distance, maximum	12½"
Pitch, coarsest	2½ DP
Whole depth, maximum	¾"
Face width, maximum	2½"
Ratio, shafts at 90	1 to 1—4½ to 1
Wheel diameters	5¾" to 13½"
Feeds, time per pass per tooth	1.9 to 11.8 sec.
Floor space	65¾" x 111¾"



Ground Spiral Bevel Gears for Controllable Pitch Propeller Unit.

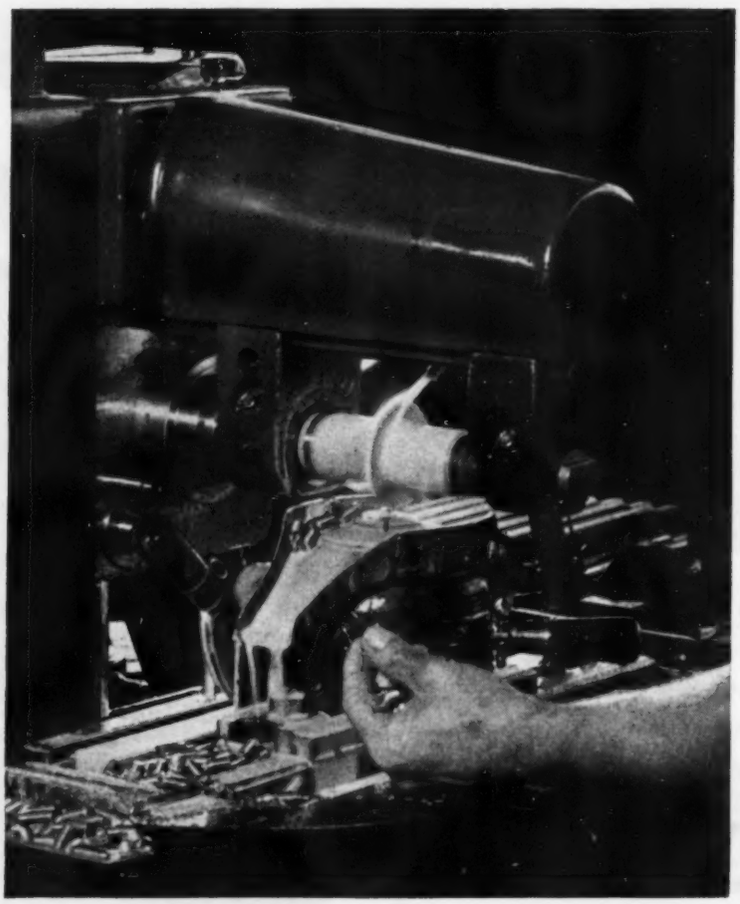
GLEASON

GLEASON WORKS

Builders of Bevel Gear Machinery for Over Seventy-five Years

1000 UNIVERSITY AVENUE, ROCHESTER, N. Y., U. S. A.

IF IT'S *FREEDOM*



CINCINNATI No. 0-8 Plain Automatic Milling Machine equipped with automatic Rise and Fall Spindle Carrier is shown at right. Be sure to send for specification catalog M-964.

WIN *with a Cincinnati!*

FROM MAINTENANCE

CINCINNATI **YOU WANT**

BUY CINCINNATI No. 0-8 PLAIN AUTOMATIC MILLING MACHINES

In the construction of the 0-8, Cincinnati engineers have succeeded in practically eliminating maintenance as a consideration. This does not mean the 0-8 has to be handled with kid gloves. On the contrary this sturdily built milling machine will give dependable, uninterrupted service whether it be in operation through one, two, or three shifts a day. With all its ruggedness the CINCINNATI No. 0-8 is a finely balanced, precision milling machine capable of fast, accurate, economical production of small parts in quantities.

The 0-8 is not a single purpose machine; it mills an exceptionally wide range of parts. When equipped with automatic Rise and Fall Spindle Carrier, an exclusive feature, it is especially useful on jobs where it is not possible for the work to traverse directly into the cut. And it takes only a minute or two to change from one automatic operating cycle to another.

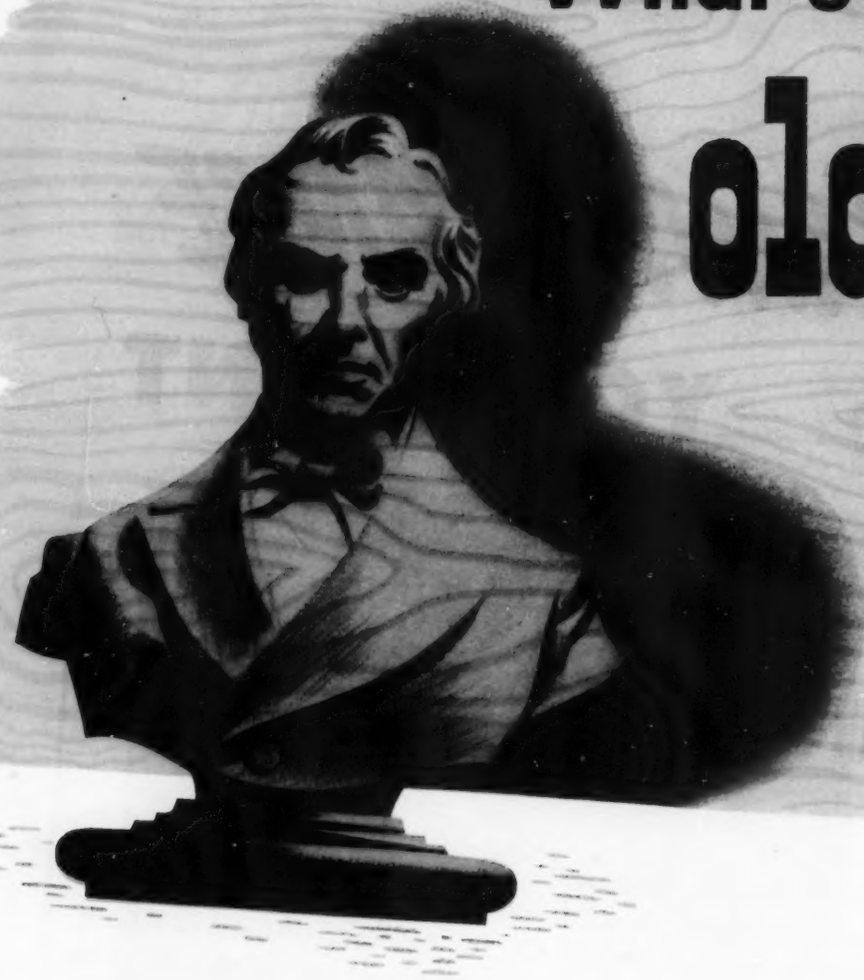
If you mill small parts in quantities and want high productivity at low cost, buy CINCINNATI No. 0-8 Plain Automatic Milling Machines. Specification catalog M-964 gives complete details on all features and their benefits. A copy of this informative catalog will be sent on request.

THE CINCINNATI MILLING MACHINE CO.

Cincinnati, Ohio U. S. A.

TOOL ROOM AND MANUFACTURING MILLING MACHINES
SURFACE BROACHING MACHINES • CUTTER SHARPENING MACHINES

What ever happened to the old oaken



LOST Sometime between 1830 and 1840, one old oaken bust of Daniel Webster. Very valuable.

It's somewhere in the attics, the cellars or the junk shops of this world. Whoever finds it will have, in addition to a priceless relic, an amazing document of American industrial history . . . a document carved in oak. Here's the story:

In 1820, a New England inventor named Thomas Blanchard carved the bust in the basement of the Capitol in Washington, and in so doing he literally shaped the course of our industrial destiny . . . For he carved that bust by machinery!

He did it, with no small measure of showmanship, to establish his claim to a patent on the Blanchard "Gun Stock" or "Copying" Lathe, and so impressed was Daniel Webster at being thus mechanically immortalized that he lent his support to Blanchard's cause. Quipped Rufus Choate, who opposed them: "Blanchard has 'turned' the head of Daniel Webster, so we need not wonder at his victory."

No one knows what ever happened to the old oaken bust of Daniel Webster, but the principle of Blanchard's Gun Stock Lathe is known throughout the world today as one of the earliest and most important of the basic machine designs developed by the great machine tool builders of New England. Because of it, we have mass production of gun stocks, axe handles, shoe lasts, and thousands of other odd-shaped objects . . . made possible by that amazing invention, and a sly bit of "logrolling" with a lathe.

...e to the ...oust of Daniel Webster?

AMONG the foremost of the machine tool builders of New England, from the days of Daniel Webster to the present, have been the engineers of Jones & Lamson and its famous parent company, Robbins and Lawrence.

History records that this company was able, with the aid of Blanchard's Gun Stock Lathe, to completely tool-up the British Government with more than 150 standard and special machine tools for the famous Enfield Armory, in 1853.

And that was nearly a century ago! Today, Jones & Lamson precision machine tools are in the front line of industry, again helping to supply a great arsenal, the greatest of all time—the Arsenal of Democracy. Jones & Lamson engineers and operators are at your call today . . . right now!

JONES & LAMSON
MACHINE COMPANY

Manufacturers of Ram & Saddle Type Universal Turret Lathes . . . Fay Automatic Lathes . . . Automatic Thread Grinding Machines . . . Comparators . . . Automatic Opening Threading Dies and Chasers

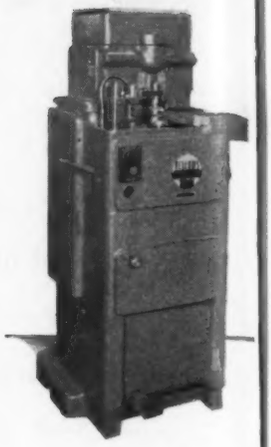
Springfield, *Vermont* U. S. A.

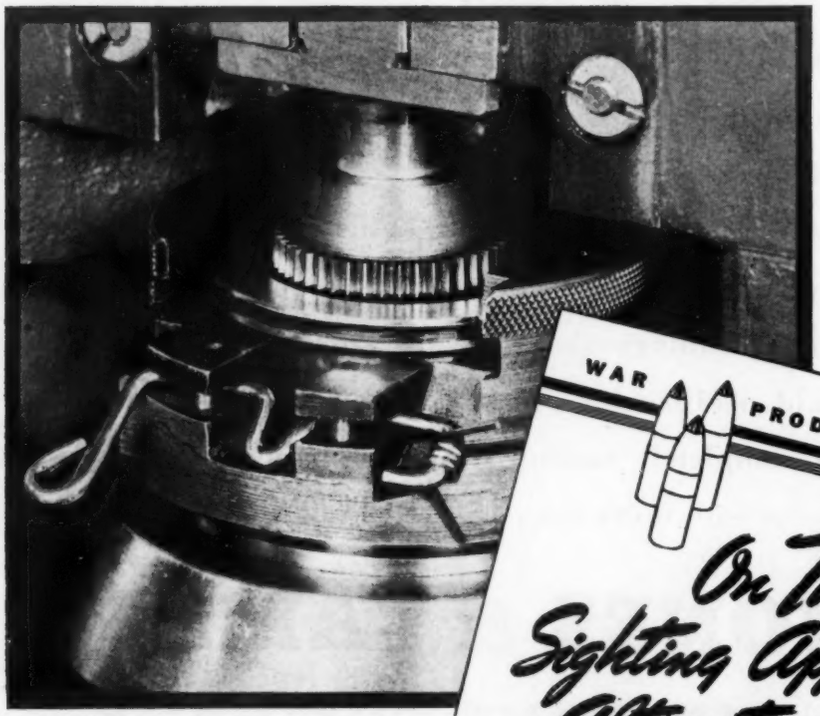
PROFIT PRODUCING
MACHINE TOOLS

SADDLE TYPE
UNIVERSAL TURRET LATHE

RAM TYPE
UNIVERSAL TURRET LATHE

THIS Small GE





Cutting the internal gear for a bomb-fuse on the 3-inch Fine-Pitch Gear Shaper.

WAR PRODUCTION BULLETIN

On Time Fuses, Sighting Apparatus, Altimeters etc., etc.

THE FELLOWS 3-INCH FINE-PITCH GEAR SHAPER IS BREAKING ALL PRODUCTION RECORDS ON GEAR TYPE PARTS

FELLOWS

MACHINES AND TOOLS FOR GEAR PRODUCTION

GEAR SHAPER

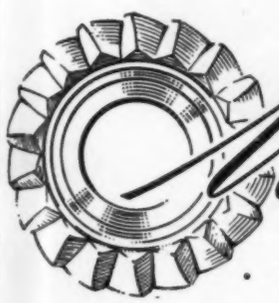
ARRIVED JUST IN TIME . . .

Figuratively, and actually, Fellows announced this new machine just in time to have it available for the multitude of small, fine-pitch gears and kindred parts which were rushed into war production.

This machine has taken over the job; it holds the work to precision tolerances, and has set a production pace beyond all precedent.

It employs cutter-spindle speeds up to 2000 strokes per minute and can be equipped with quick-acting loading fixtures for holding the work. Inherent Fellows precision, ease of cutter duplication, and the Service that goes with the machine are other advantages that appeal to experienced production men.

Fellows will be glad to place its Small Gear Shaper Circulars in the hands of all who are interested. Write: The Fellows Gear Shaper Company, Springfield, Vermont—or 616 Fisher Building, Detroit, or 640 West Town Office Building, Chicago.



Method

. . . . FROM BLANK TO FINISHED GEAR

IF IT'S *freedom from*

CINCINNATI Hydraulic Universal Grinding Machines are available in 12", 14", 16", and 18" swings; between-center distances up to 72". Be sure to send for specification catalogs G-486 and G-474.

CINCINNATI

maintenance YOU WANT

BUY CINCINNATI HYDRAULIC UNIVERSAL GRINDING MACHINES

One thing of which you may be certain — your grinding machine maintenance will practically disappear when you use CINCINNATI Hydraulic Universals.

To have machines down for repairs is serious in normal times — nowadays it could prove disastrous. You just can't afford to take chances on delaying your production schedules because of grinding machine failures.

CINCINNATI Hydraulic Universals can be depended upon to keep going continuously if need be; to retain their accuracy over long periods of time under strenuous conditions; to give the sort of service and performance you would naturally expect from a finely constructed, precision instrument. Then, too, they are flexible enough to handle a wide range of toolroom grinding and general manufacturing work speedily, accurately and economically.

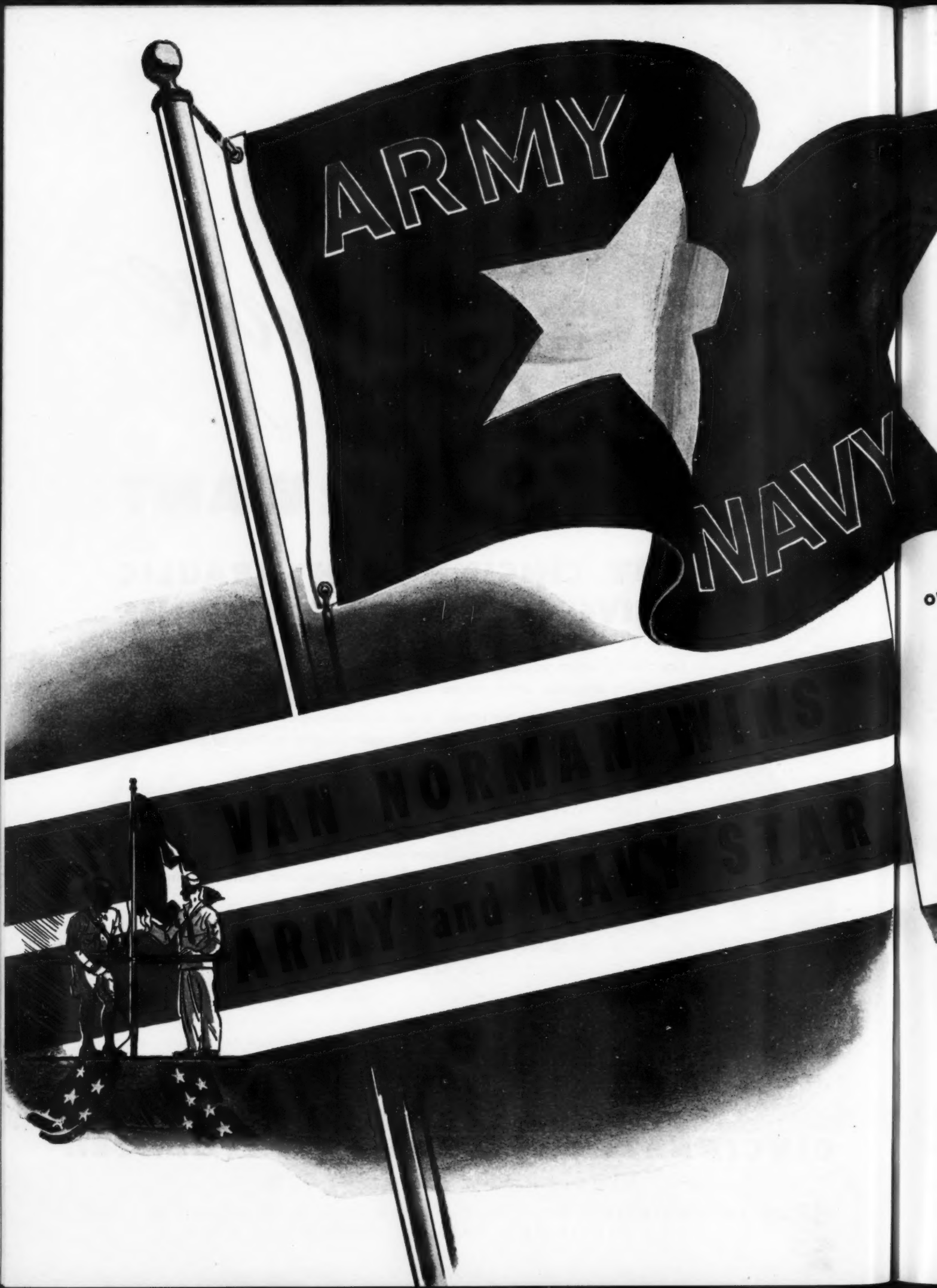
Further information on maintenance elimination as well as complete details on all features of CINCINNATI Hydraulic Universal Grinding Machines are covered in specification catalogs G-486 and G-474. Send for your copies today.

WIN *with a Cincinnati!*

CINCINNATI GRINDERS INCORPORATED

Cincinnati, Ohio U. S. A.

CENTER TYPE GRINDING MACHINES • CENTERLESS GRINDING MACHINES
CENTERLESS LAPPING MACHINES


ARMY
NAVY
VAN NORMAN WINS
ARMY and NAVY STAR

IN ACKNOWLEDGING THE AWARD TO HIS COMPANY OF THE ARMY AND NAVY STAR, VAN NORMAN PRESIDENT JAMES Y. SCOTT SAID IN PART:

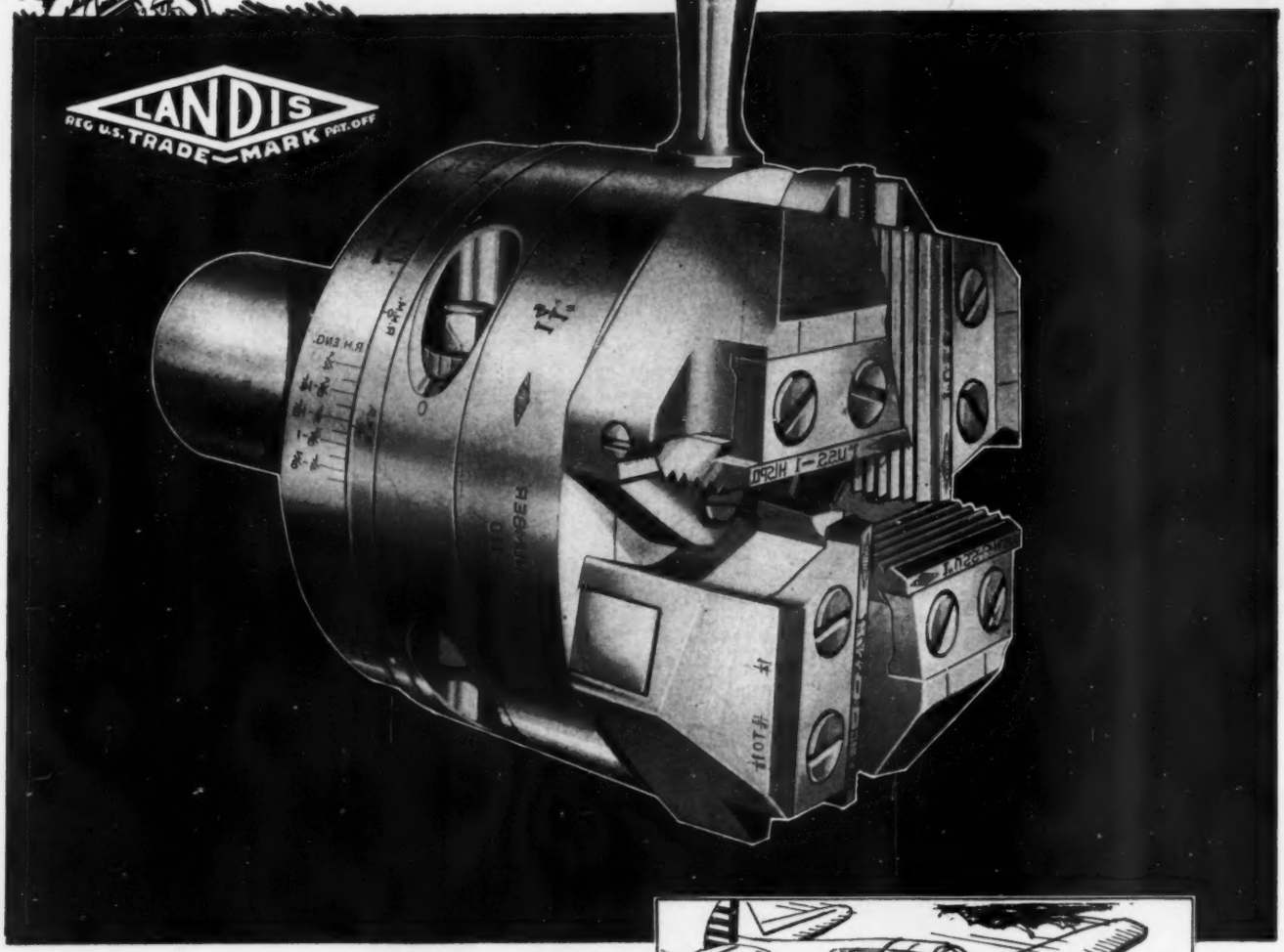
"... this flag is more than just a flag. It symbolizes the tie that today exists between the fighting men of our Army and Navy and the fighting men and women of our labor battalion. It is a symbol of a new, greater spirit ... of unity, of devotion, of loyalty and determination in the cause of victory which we must and shall have, and a unity of thought between all sections of our people in serving their country."

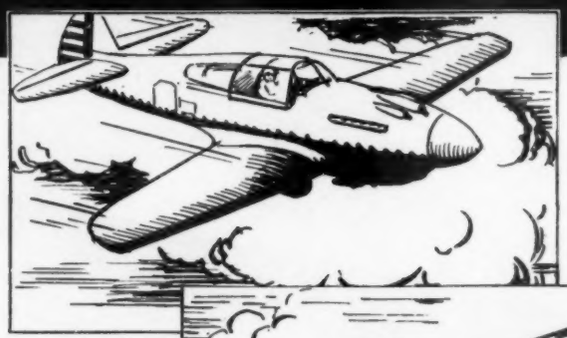
This burgee was recently raised over the Van Norman plant in recognition of the company's record in producing milling machines and oscillating radius grinders for war-production plants, and automotive service machines for the armed forces.

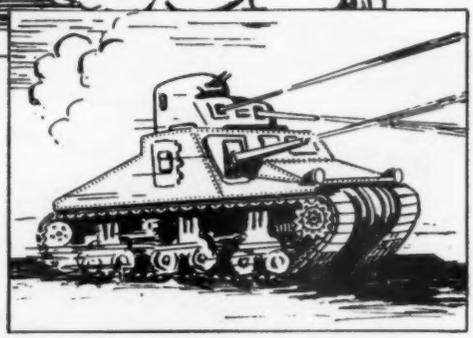
To the last man and woman now wearing the Star button, Van Norman regards this insignia as a challenge for the future ... to top the highest former levels of production. And this challenge will be met ... for Van Norman will keep on earning the Army and Navy Star every hour of every day, until Victory is final and complete.

VAN NORMAN MACHINE TOOL CO., SPRINGFIELD, MASS.

In the Vital War Plants







The LANDIS LINE

THREAD CUTTING MACHINES
- Landmaco Threading Machines
- Bolt Factory Threaders
- Automatic Forming and Threading Machines
- 4 Spindle Semi-Automatic Threading Machines
- Pipe and Nipple Threading Machines

THREAD CUTTING DIE HEADS
- Landmatic (for Turret Lathes and Screw Machines)
- Landex (for Automatic Screw Machines)
- Lanco (for Automatic, Semi-Automatic and Hand-Operated Threading Machines)
- Lanco Pipe and Nipple Threading Heads
- Stationary Pipe Die Heads
- Reverse Taper Die Heads
- Standard Rotary Die Heads

PRECISION THREAD GRINDERS

PIPE THREADING AND CUTTING MACHINES

ROLLER PIPE CUTTERS

CHASER GRINDERS

COLLAPSIBLE AND ADJUSTABLE TAPS

LANDIS MACHINE COMPANY

of All United Nations

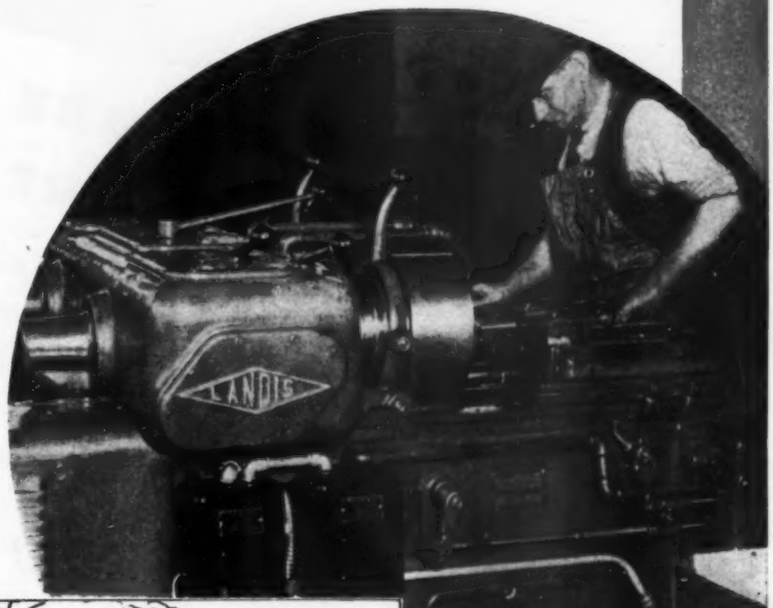
LANDIS THREADING EQUIPMENT IS HELPING TO WIN THE WAR

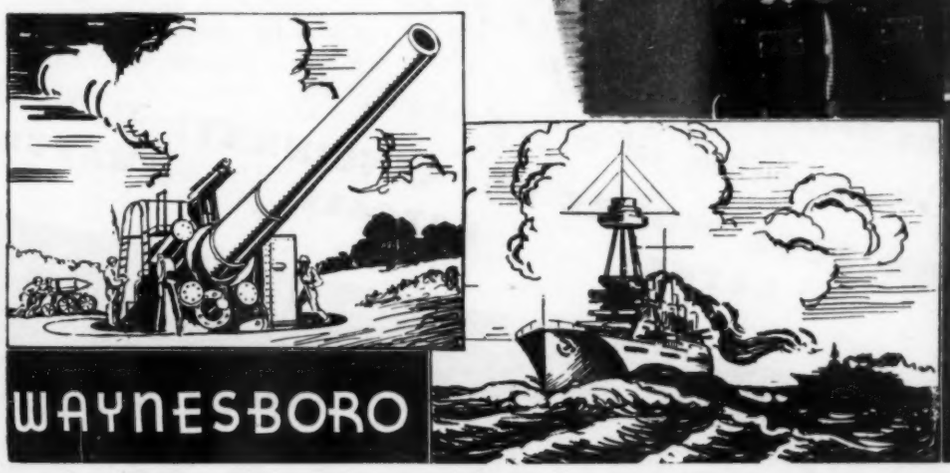
Landis Threading Machines and Tappers are working 24 hours a day to keep our Army, Air Forces and Navy supplied with munitions and the finest implements of war.

Garand Gun Barrels, Shell Adapters, Booster Cups, Fuse Studs, Cartridge Containers, Shell Noses, Fuse Bodies, Demolition Bombs, Anti-Aircraft Shells, Trench Mortar Shells and High Explosive Shells are some of the munition parts precisioned to minute accuracy by Landis Machines.

In the speed-up program of producing Tanks, Aircraft, Bombers, Submarines, Diesel Engines and Destroyers, Landis Machines are confidently relied on day and night by the men and women who are making America's Amazing Production Program possible.

Write for Bulletin
"Be Threadwise—
LANDISIZE"





WAYNESBORO PA, U.S.A.

SHIPS AND MORE SHIPS!
PRODUCTION AND MORE PRODUCTION!

That's what the Navy needs and that is exactly what the Navy is getting. Hundreds of "American" Lathes are operating on a 24-hour schedule to give the Navy the ultimate in production.

In our Navy Yards and Shipbuilding Plants "American" Lathes are meeting every challenge of increased schedules. They are producing as they have never produced before and at the same time are maintaining amazing standards of accuracy.

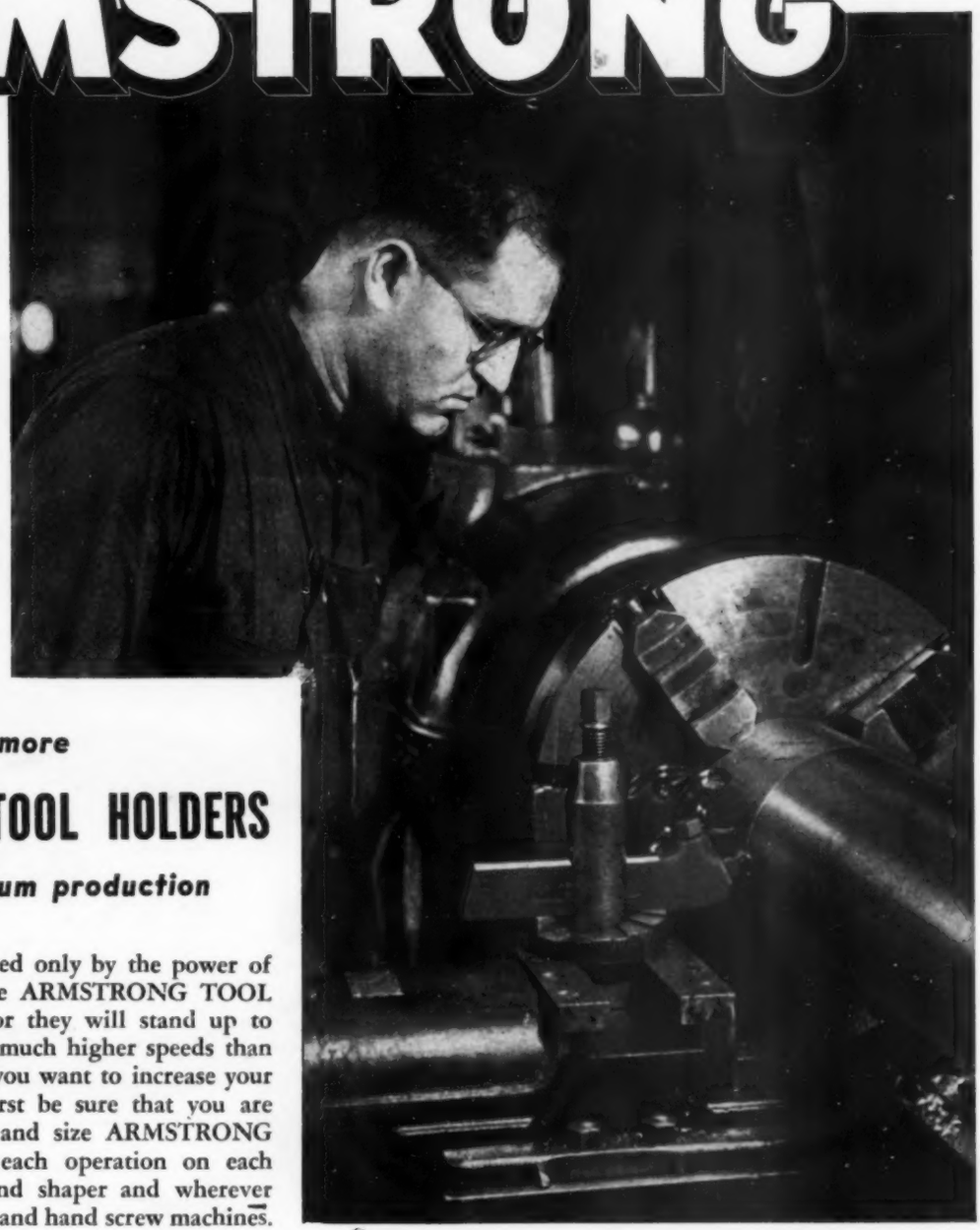
For all-out Lathe production, call on "American".

THE AMERICAN TOOL WORKS CO., CINCINNATI, U. S. A.

LATHES **RADIALS** **SHAPERS**

"AMERICAN" ENGINE LATHES

ARMSTRONG



Use more

ARMSTRONG TOOL HOLDERS

to get *maximum production*

Production rate is limited only by the power of the machine tool where ARMSTRONG TOOL HOLDERS are used for they will stand up to much heavier feed and much higher speeds than are commonly used. If you want to increase your machine tool output first be sure that you are using the correct type and size ARMSTRONG TOOL HOLDER for each operation on each lathe, planer, slotter and shaper and wherever possible on turret lathes and hand screw machines.

More pieces per hour, will not be the only benefit of going "all ARMSTRONG." You will end all tooling up delays, all time out for tool forging and "tool dressing"—will get more production machine hours from every work week. And, you will cut your high speed steel consumption 90% because each ounce of high speed steel in an ARMSTRONG TOOL HOLDER does the work of 10 ounces in a forged tool.

Use ARMSTRONG TOOL HOLDERS wherever possible to increase hourly output, to increase production machine hours and to save high speed steel.

ARMSTRONG BROS. TOOL CO.

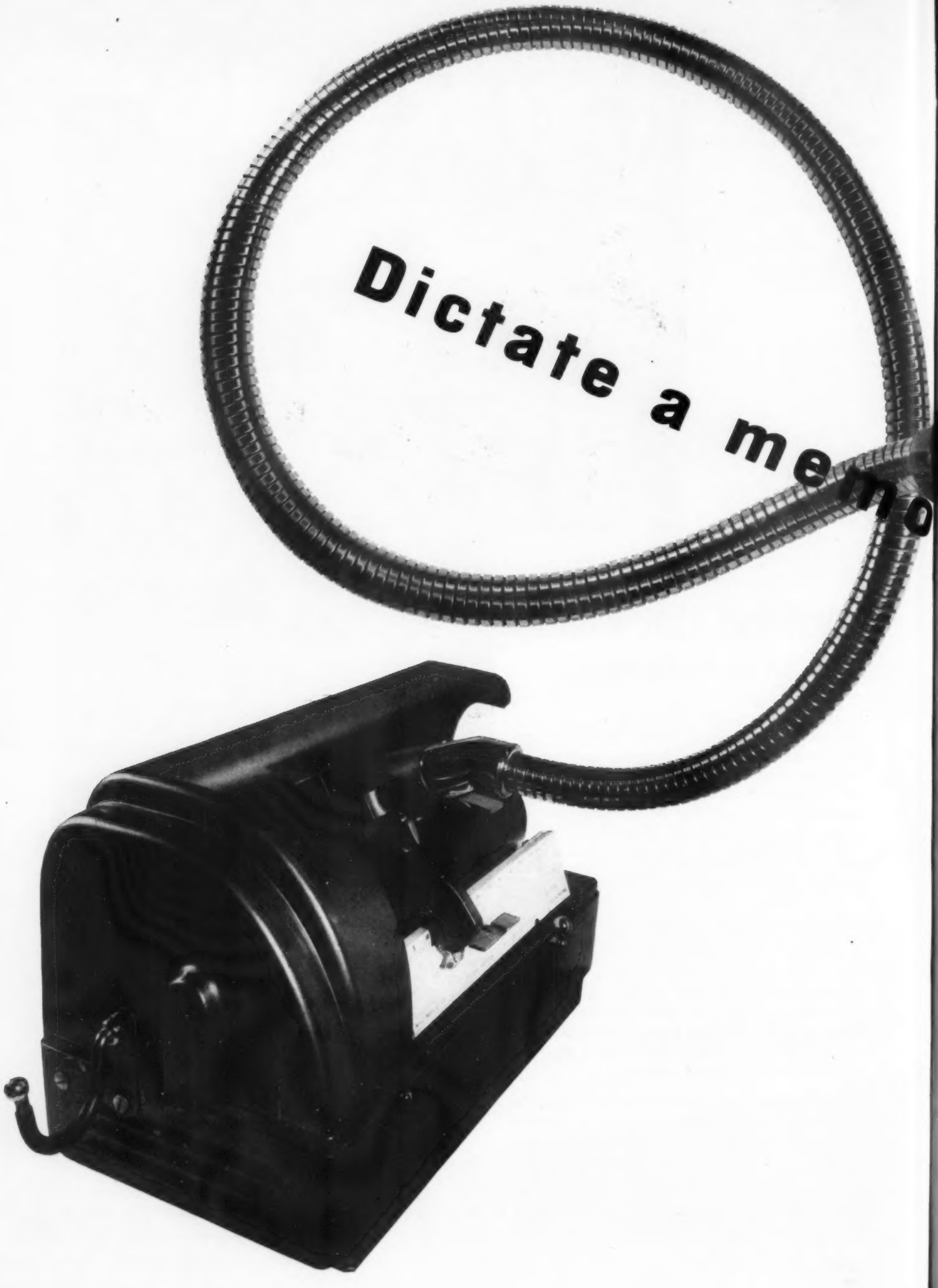
"The Tool Holder People"

315 N. Francisco Ave. Chicago, U. S. A.

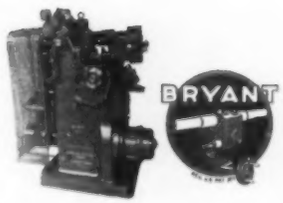
Eastern Warehouse & Sales:
199 Lafayette St., New York

Buy ARMSTRONG TOOLS from your Supply House

ARMSTRONG TOOL HOLDERS Are Used in Over 96% of the Machine Shops and Tool Rooms


Dictate a memo

to Bryant



Don't wait until you get stuck on a problem of internal grinding. Even though it looks relatively simple, dictate a memo to Bryant and mail it to Bryant with blueprints.

Bryant engineers may possibly uncover more than one difficulty that is not at first apparent — uncover it and overcome it.

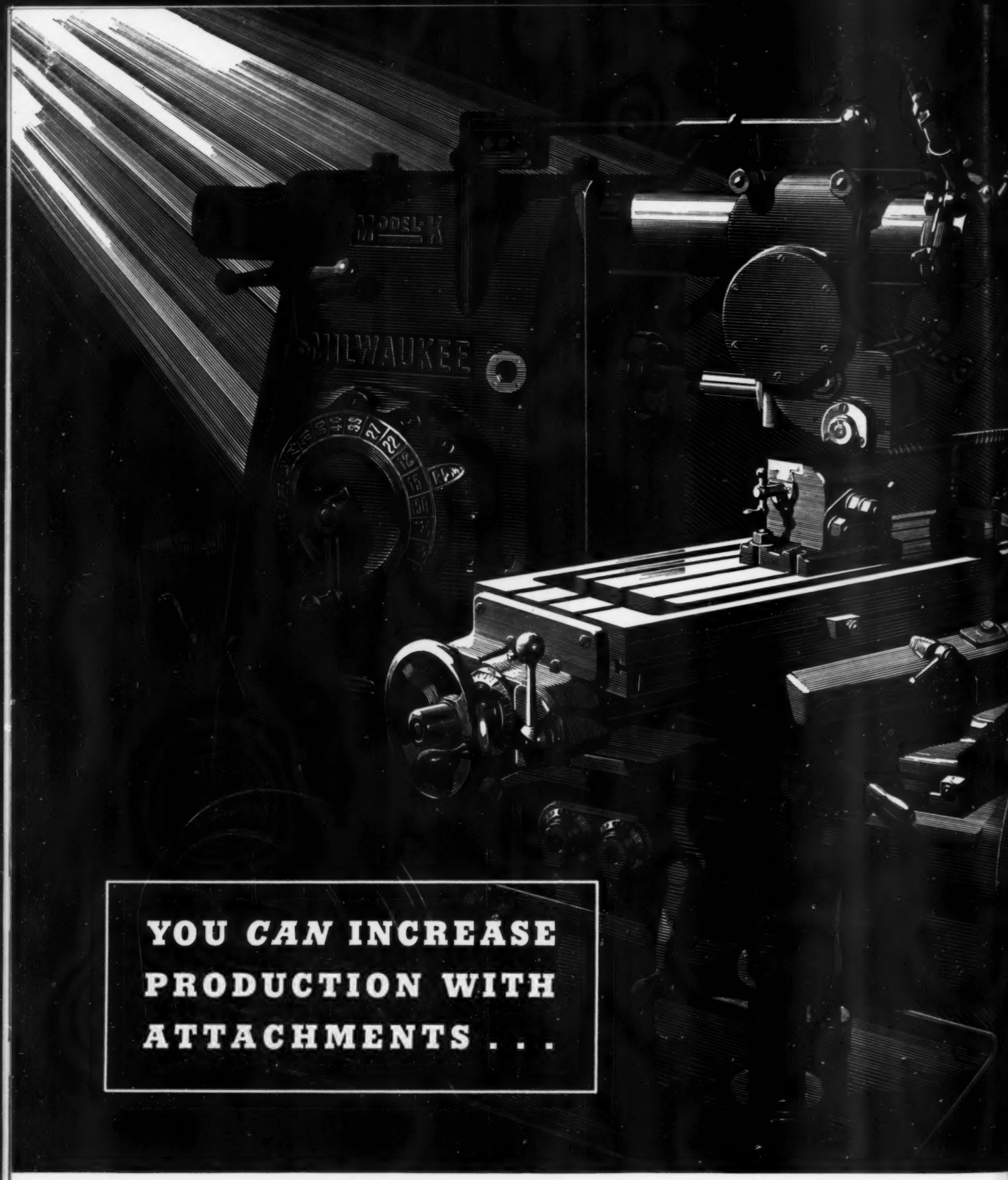
That often happens when they dig under the surface on a simple looking job. Almost as often Bryant engineers also reveal unexpected ways to combine operations, to cut costs and reduce spoilage.

And please remember that it will not obligate you to dictate a memo to Bryant. Bryant production capacity has already been tripled, and it is constantly increasing. Every day Bryant engineering studies are being rushed for manufacturers with war contracts. At the same time, Bryant engineers are also pushing steadily ahead with plans for far-sighted firms — plans for cutting costs and increasing profits on peace time products for tomorrow's markets.

If you too believe in planning ahead for post-war profits, let Bryant engineers begin to help you at once. It will not obligate you to dictate a memo to Bryant.

BRYANT CHUCKING GRINDER CO.

SPRINGFIELD, VERMONT, U. S. A.



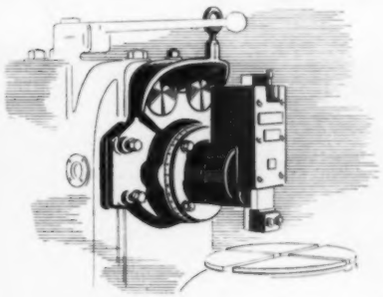
YOU *CAN* INCREASE PRODUCTION WITH ATTACHMENTS . . .

Production men are finding that with standard attachments they can increase the output of their Milwaukee Milling Machines.

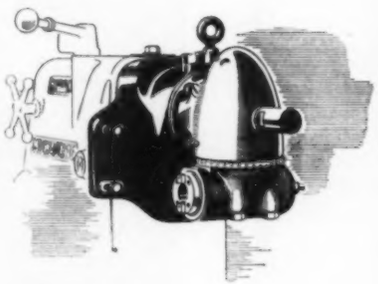
For instance, the Thread Milling Attachment illustrated above, provides a complete and efficient Thread Miller—a quick conversion of existing equipment that is particularly advantageous where a standard Thread Milling Machine is not available. The attachment is a strong, compact unit which is rigidly mounted in place on the overarms and column face of the milling machine. It mills all regular forms of threads and a wide range of special threads.

Milwaukee MACHINE

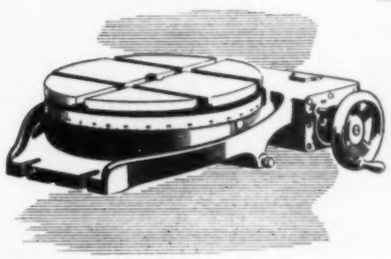
CHECK over the attachments shown here—they are representative of a complete line of accessory equipment which can increase the usefulness of your present Milwaukee Milling Machines.



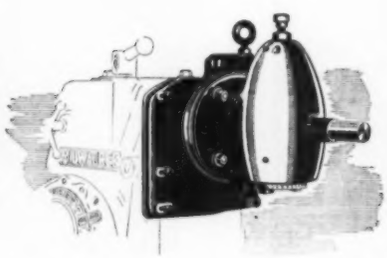
Slotting Attachment. Many slotting operations can be performed by using this attachment in connection with the dividing head or rotary table. In many cases, it makes the purchase of a Slotting Machine unnecessary. Bulletin No. 656B.



Standard Universal Milling Attachment — quickly converts a horizontal milling machine for vertical operations—also permits milling of single and compound angles on dies, jigs, fixtures. Can be swivelled 360° in two planes. Information in Bulletin No. 658.



Rotary Table — Index and Hand Wheel Types — for speed and accuracy in circular milling and drilling and boring operations. Available in 12-16-20-24" diameters, either hand feed or power feed types. Write for Bulletin No. 652F.



Heavy Duty Swivel Head Vertical Milling Attachment — quickly adapts a horizontal milling machine to vertical milling. Can be rigidly mounted in place in less than ten minutes. Its spindle speed is the same as the milling machine spindle. Write for Bulletin No. 752C.

Kearney & Trecker representatives are trained in all phases of milling practice. They are at your service to suggest ways and means to get the most from your present Milwaukee equipment. Write for the name and address of the nearest representative — make use of his knowledge and experience — there is no obligation involved.

Write for complete information on this and other Milwaukee attachments and accessories — standard and special — to increase the range of usefulness of your present Milwaukee equipment.

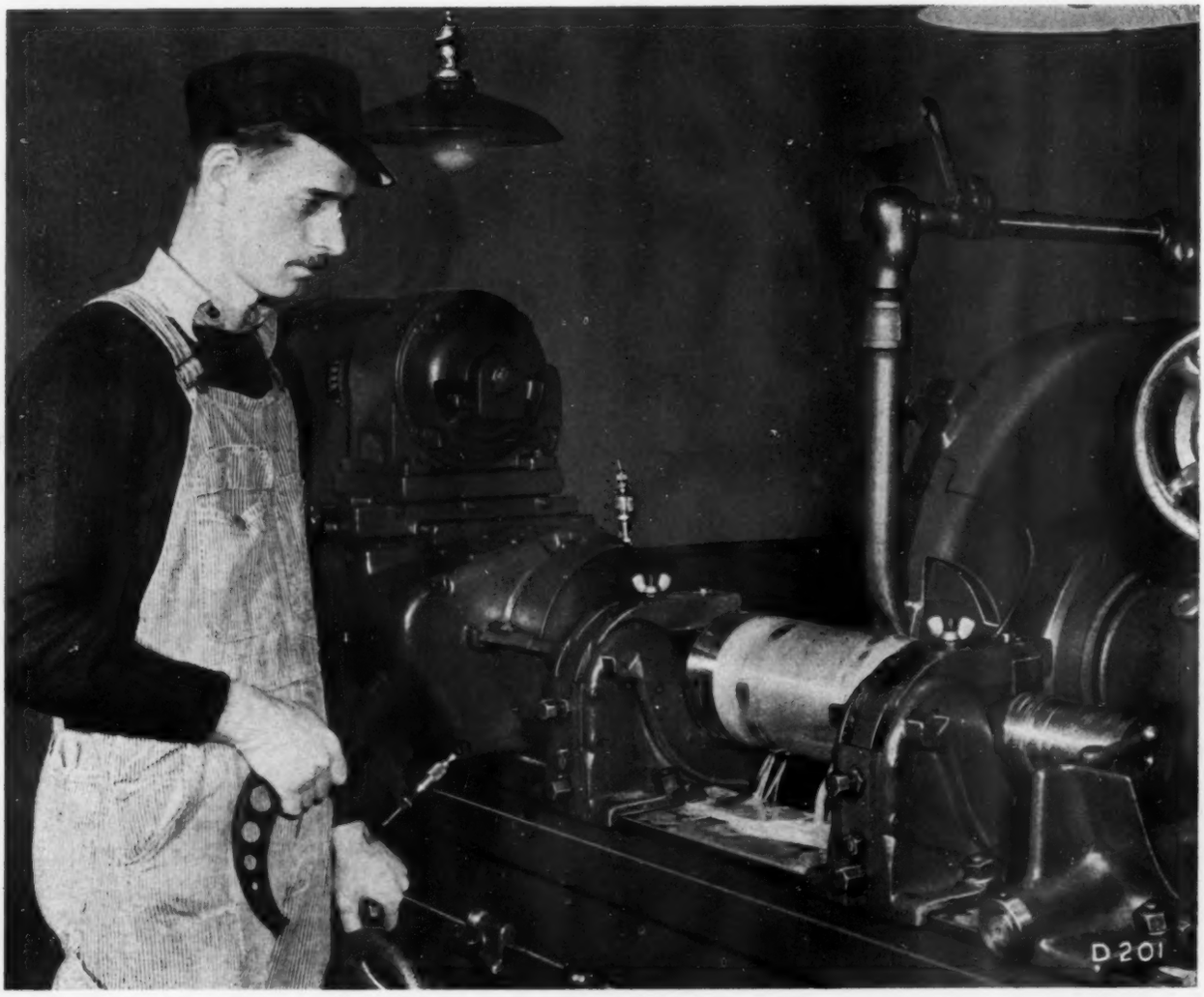
KEARNEY & TRECKER CORPORATION
MILWAUKEE, WISCONSIN, U.S.A.

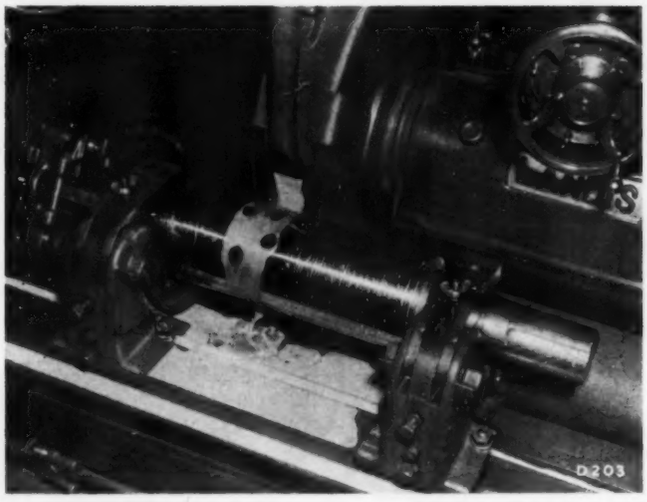
KEARNEY & TRECKER
CORPORATION

E T O O L S

TO FINISH THE JOB QUICKER . . .

ASSURE CONSISTENT





Above:—This Landis 10" x 48" Type C Plain Grinder is installed in the plant of the Allison Co., Connecticut. It is used for the grinding of feeder rolls used in the manufacture of abrasive wheels.

Left:—A close-up of the operation shown above. Notice that the roll is not ground between centers, but instead is held by two roll heads and is driven by the headstock which is equipped with an equalizing drive. Close accuracy results.

Unusual Performance As Usual

PRECISION LANDIS GRINDERS

PRECISION BY
USING A LANDIS LIKE THIS

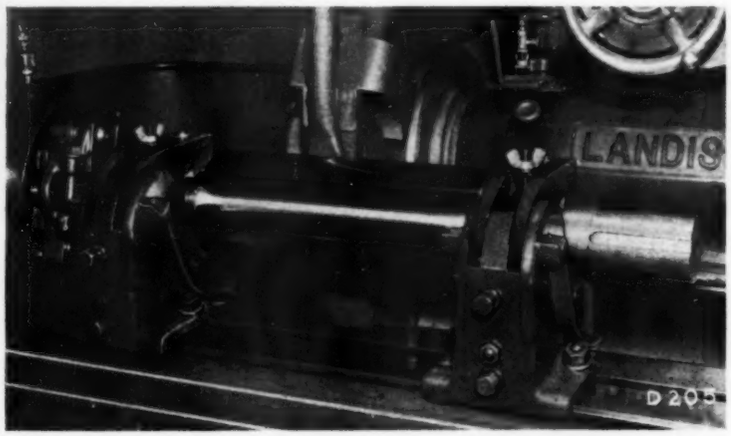
Why waste valuable time coaxing precision and rapid production from that old, out-dated grinding machine?

Why not assure yourself of consistent precision performance by using a Landis grinder for the jobs that are in a hurry. Consider for instance....

The Allison Company ***of Connecticut uses a*** *Landis 10" x 48" Type C Plain Hydraulic Grinder* ***for the grinding of feeder rolls used in the manufacture of abrasive cutting and slitting wheels.*** *Accuracy* ***is of primary importance.***

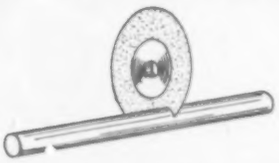
On the Landis grinder the roll diameter is finish ground *within a limit of +.001".* ***and the entire length of the roll is held*** *within a tolerance of +.001".* ***Nor is production sacrificed in order to obtain this precision. In spite of the close limits*** *production has risen from 1 roll per 10 hour day to 4 rolls per 8 hour day.*

You can depend on Landis grinders for precise, productive performance—all of the time. YOU profit only when it takes place in your plant.

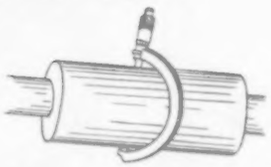


File No. 203

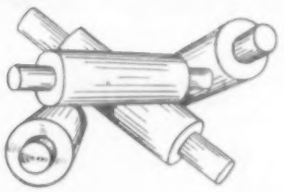
THIS IS THE STORY



The Allison Company, Connecticut, manufactures abrasive cutting wheels used to cut or slit metal, glass or ceramic products. These wheels are made in diameters of from 1" to 20" and in thickness from .015" to 1/8", however, certain special wheels are now being made that are held to the almost unbelievable size of .005" in thickness.



In making these wheels, feeder rolls are used to roll out the processed abrasive impregnated rubber to its final thickness. Because the accuracy of the wheel is determined by the rollers, precision is highly important. The Allison Company is the only firm in the world that makes abrasive wheels within such close tolerances.



Concerning the performance of their Landis grinder the Vice President of The Allison Company says, "It has satisfactorily met every requirement of fast and accurate work demanded of it." This company knows that their grinding machine can be depended upon for consistent precision grinding at a high rate of production.

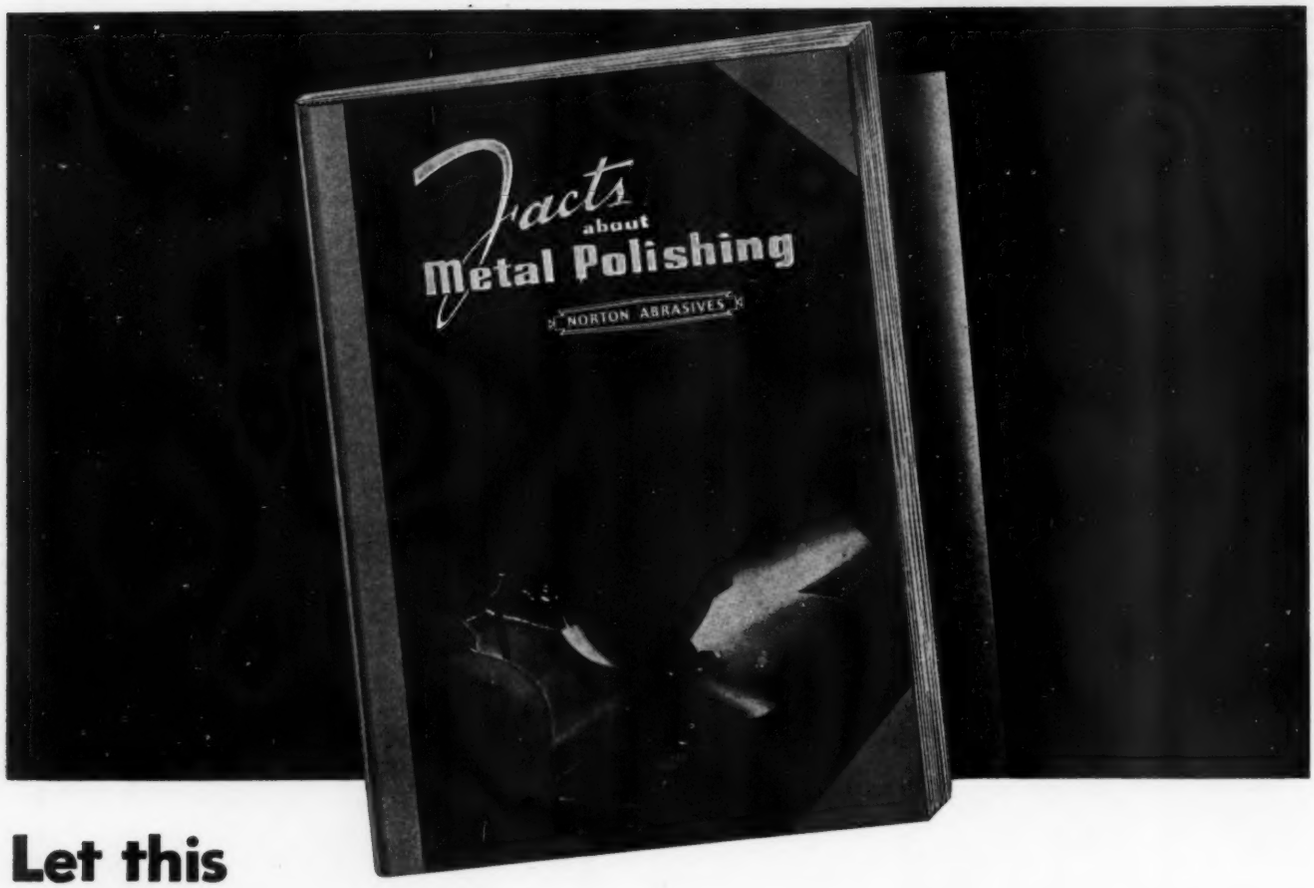
LANDIS TOOL CO. WAYNESBORO, PENNSYLVANIA

MICROSPHERE WHEEL SPINDLE BEARINGS

MULTI-SPEED HYDRAULIC TABLE TRAVERSE

HYDRAULIC STRAIGHT INFEED

398



Let this Booklet Help You—

Get More Service from Your Polishing Abrasive

IT'S just what the name implies—"Facts about Metal Polishing," 39 pages of useful information. Typical chapter subjects are: Preparation of Glue, Types of Polishing Wheels, Setting Up Polishing Wheels, Setting Up Abrasive Belts, Correct Drying, Factors of Efficient Polishing.

Today, when it's absolutely necessary to get maximum service from your abrasive, this booklet is doubly valuable. Write for a copy now—no charge nor obligation. Just ask for Form 1340AM.

NORTON COMPANY, WORCESTER, MASS.

Distributors in All Principal Cities

G-140

NORTON ABRASIVES

28 Tons Sitting on Nothing

TO PULL THIS 28-TON LEVIATHAN into the air—to keep it flying—requires engines of super horsepower—engines that didn't exist, except on a drawing board, not so many months ago.

How the power of 1500 horses can be compressed into an engine hardly wider than your outstretched arm—how this terrific force can be delivered to turn a propeller at the end of a shaft is all a part of America's industrial genius.

A secret of the modern airplane engine's might is gears—gears so light in weight, ground to such close tolerances that engineers almost despaired of ever producing them except under laboratory conditions.

But the urgency of war demanded that these gears be mass produced at no sacrifice in lightness or precision. Today in the plant of Foote Bros. Gear and Machine Corporation these "jewels of power transmission" are flowing out to help power American planes.

All this meant new manufacturing techniques—new production methods. American manufacturers may look forward with confidence to the application of these developments to peacetime speed reducers and gears to assure better machines—quieter machines—produced at lower cost.

FOOTE BROS. GEAR AND MACHINE CORPORATION
5301 S. Western Boulevard • Chicago, Illinois

FOOTE BROS.

SPEED REDUCERS • GEARS • SPECIAL ASSEMBLIES

Two TOOL STEELS CAN CUT AS CHEAPLY AS ONE

WHAT'S more important, two tool steels can cut twice as *fast* as one, and speed is the prime urgency in war production.

But there are ways of increasing production beside installing more modern types of machine tools. A better tool steel, or one better suited to an individual job, can materially speed up the work your existing equipment is capable of doing.

Take the case of a big Detroit plant, using DBL High Speed Tool Bits instead of a high-tungsten variety, machining castings of X-1340 steel with a surface hardness of 33 Rockwell C, and a subsurface hardness of 26-28C. The DBL Tool Bits showed 30% increase in work done between grinds, running at 166 RPM against a previous speed of 100 RPM.

Our Service Staff is ready to help you team up tool steels with your production jobs, for more work done per machine. They'll show you the best *alternate* steels, too, as a precaution in keeping the lines moving.

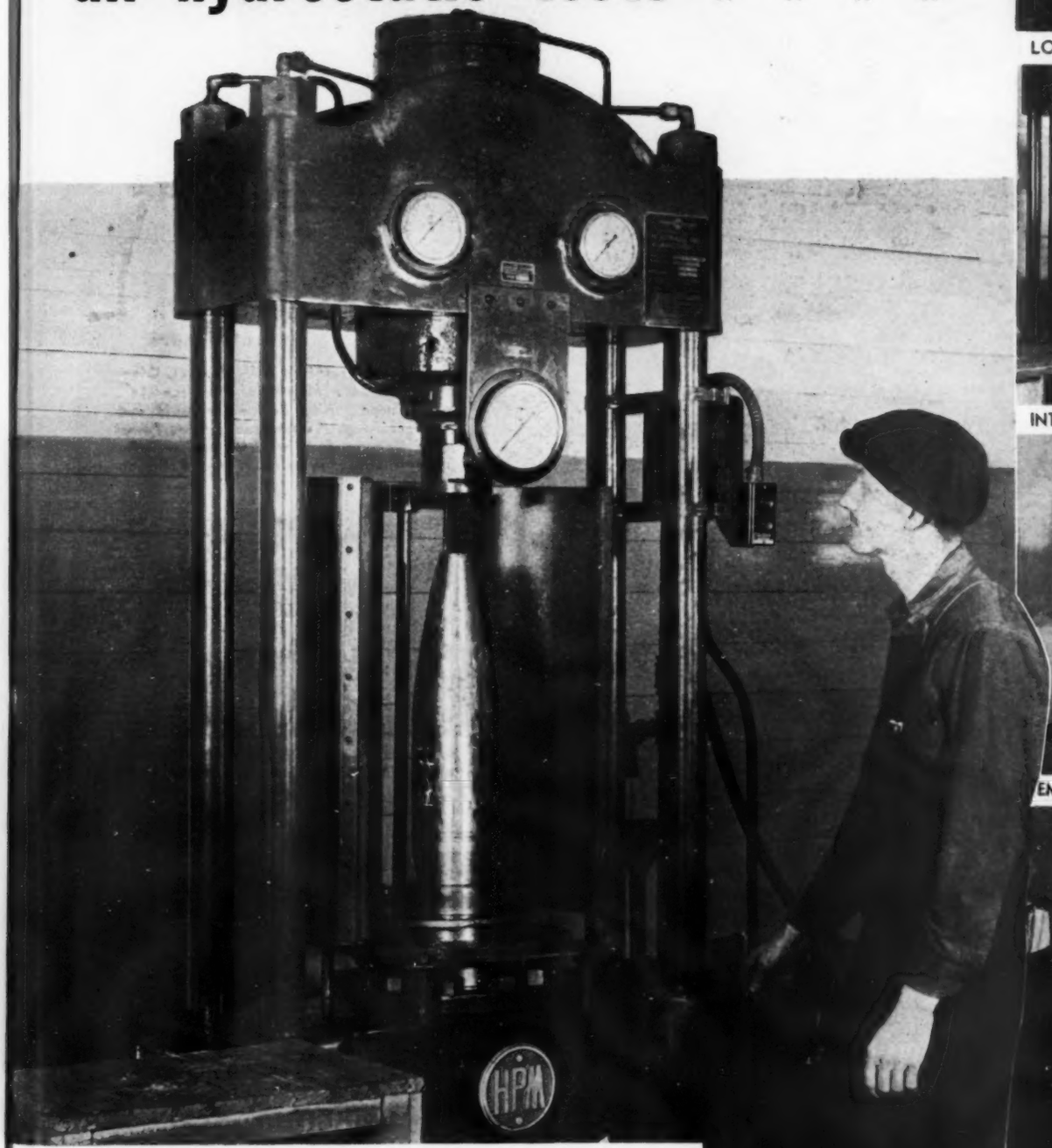
Allegheny Ludlum
STEEL CORPORATION
GENERAL OFFICES: PITTSBURGH, PENNSYLVANIA

The HPM Shell Testing Press is the accepted standard for all hydrostatic tests ★ ★ ★ ★

LOADING SHELL WITH WATER

INTENSIFYING WATER IN SHELL

EMPTYING WATER FROM SHELL



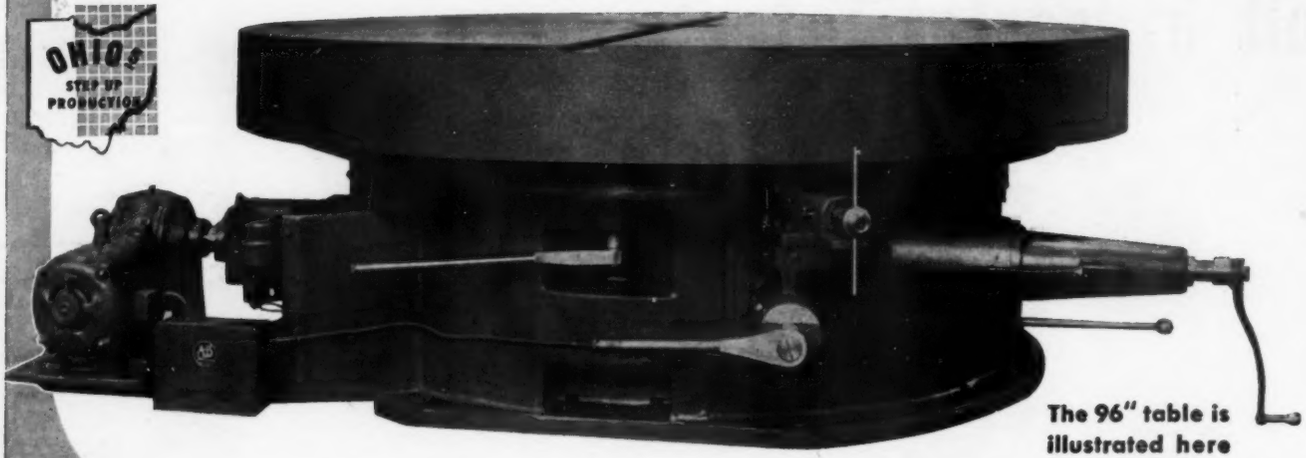
HPM Shell Testing Press is the answer to Government requirements, which read as follows:—"There shall be installed in each plant engaged in machining shell, one set of hydraulic equipment capable of testing shell to an internal hydrostatic pressure of 25,000 pounds per square inch. The equipment shall be used by the inspector for testing doubtful shell, such as those which show evidence of cracks or porosity."

● Write for complete details concerning this HPM shell testing press. HPM builds a complete line of self-contained hydraulic presses for munition manufacture. Call in an HPM Engineer to assist in recommending the correct press equipment required to manufacture shells or cartridge cases. » » » »

THE HYDRAULIC PRESS MFG. COMPANY, MOUNT GILEAD, OHIO, U.S.A.

District Sales Offices: New York, Syracuse, Detroit and Chicago. Representatives in Principal Cities

OHIO *Revolving* TABLES



The 96" table is illustrated here

Graduated accurately in ½ degrees. Overall height—36". Thickness of table top—14". Anti-friction raising device for rapid and easy revolving. Pressure lubrication. Power rapid traverse. Four precision dial or index pin positions for indexing. Wgt.—18,000 lbs.

Round or square, 24" to 96", many combinations

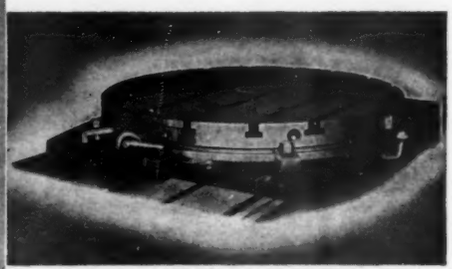
The 96" Ohio Revolving Table is designed primarily for use with floor type horizontal boring mills, but can be used with other types of machine tools. Intended for extra heavy duty service and large jobs; it carries a load of 20,000 to 25,000 pounds with ease. Features:

Equipped with anti-friction raising device for raising top and easy, rapid revolving. Large-diameter anti-friction thrust bearing supports table when raised from its bearing. Can be furnished with or without power rapid traverse.

Table unit is designed for mounting one or more jobs. By using one or more machine tools, several machining operations can be performed simultaneously. For example, a horizontal drill can perform drilling and tapping operations on one piece, while a horizontal boring mill can do boring and milling work on another piece. Other positions can be used for loading.

Unit can be mounted on bed plate or individual foundation. Design makes operation possible when set in a pit below floor surface.

THE OHIO MACHINE TOOL COMPANY, KENTON, OHIO



48" diameter revolving table on base plate with anti-friction raising device and index pin with four stops.

48" square worm feed revolving table with anti-friction raising device and index pin and four stops.

Ohio Revolving Tables are the expression of over 50 years' machine tool manufacturing experience. They are high grade precision units, accurately graduated in ½ degrees. They can be supplied with indexing pins with any number of indexing positions or precision indexing units consisting of precision dial indicators and adjustable stops. You can arrange them to suit all types of standard horizontal or vertical boring machines.

OHIO DREADNAUGHT

HORIZONTAL BORING, DRILLING AND MILLING MACHINES • SHAPERS • PLANERS

STANDARD
Dial Bore Gages
"CONVOY
YOUR PARTS
THRU
PRODUCTION"
STANDARD GAGE CO., INC.
POUGHKEEPSIE, NEW YORK

Lost
Millions of pounds of Stainless Steel Scrap that contain precious nickel and chromium. Last seen in dark corners and old barrels, in forgotten places. Lives of brave American boys (and American ideals) depend upon its being found, and quickly. REWARD for turning in your scrap? Money, yes—but far greater than that, the satisfaction that can come only from having performed a Wartime service to your Country.

more than corrosion resistance

IS SOME OF IT LOST *in Your Plant?*

Steel scrap is urgently needed now to meet the demands of a modern TOTAL warfare. *Stainless Steel Scrap,* with its precious nickel and chromium alloys, is especially needed. It is the guts of the planes, ships and other fighting tools which your boy, and others like him, *must have,* in plenty, to win for his country—your country!

Stainless Steel Scrap that is forgotten, neglected, helps the enemy, not America.

This forgotten nickel and chromium may, at this very moment, be the key to *more* vital equipment that is needed before a victory can be won on a distant battlefield.

You can make *more* of these and other precious alloys available *immediately. You* can render your country a service. In and around your plant there may be countless places where steel scrap has been overlooked. The answer is a Salvage Drive, in your plant. Now! Take personal charge of it, or designate some other responsible executive to enlist the help of every department, every man. Explore the dark corners! — dig out the Scrap! — Get IN the Scrap for VICTORY!

☛ *Be sure to separate your* Stainless Steel Scrap. *It is worth more to you—and to our soldiers—when properly separated.*

☛ Save time *in scrap accumulation. See that all turnings or press scraps are collected in properly marked containers* at each machine. *Then turn it in regularly!*

☛ *Ask your steel supplier or scrap dealer for information that will help you to distinguish various types of steel.*

THE CARPENTER STEEL COMPANY, READING, PA.

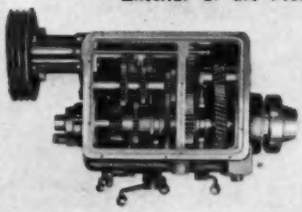
Carpenter STAINLESS STEELS

BRANCHES AT Chicago, Cleveland, Detroit, Hartford, St. Louis, Indianapolis, New York, Philadelphia

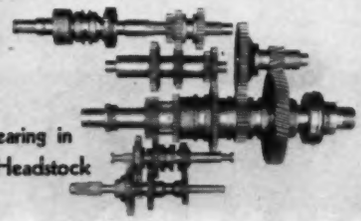
The Metalmaster

...features Advanced Headstock Design!

Exterior of the Headstock



Interior of the Headstock



Gearing in the Headstock

HEADSTOCK . . . . incorporates advanced design, engineering and construction that makes for dependable, never-failing service. Heavy walls plus sturdy center bracing, assures a steady, yet quiet, flow of uniform power. Twelve spindle speeds are available, both forward or reverse. Simplified control system, consisting of three grouped handles, enables operator to shift speed with ease!

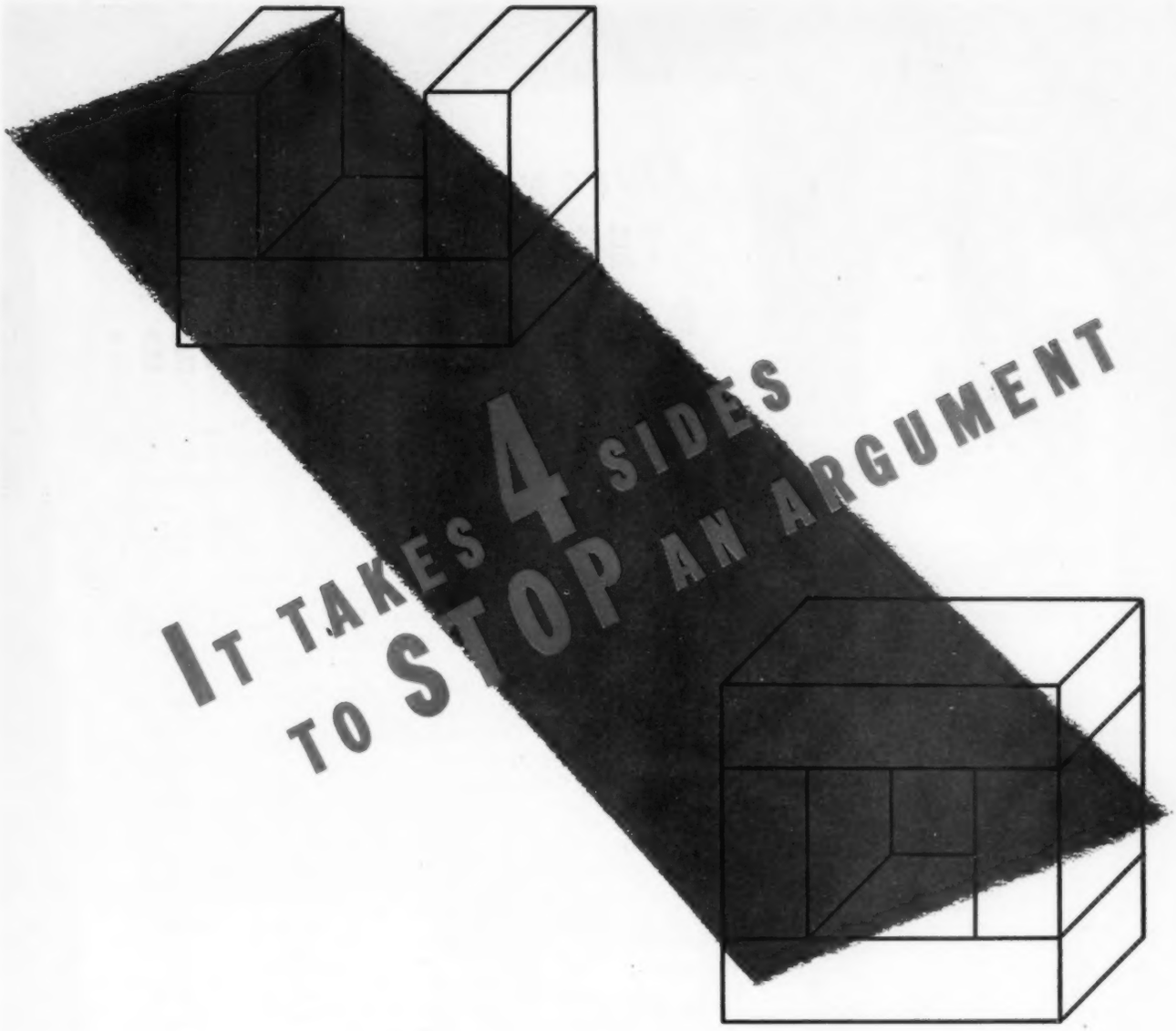
GEARS . . . . are machined from heat-treated nickel alloy steel and, after hardening, teeth are carefully shaved and lapped. Gear shafts are short and heavy, mounted on tapered roller bearings. The gear trains for the leadscrew reverse—also the fine and coarse compounding drive to the feed box—are in the head.

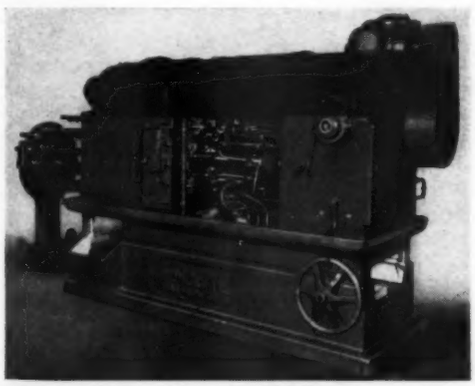
LUBRICATION . . . . splash as well as a self priming pump that forces filtered oil to the upper shaft bearings, the clutch and the brake. There are two sight gages, one indicating proper level for efficient operation, the other the flow of oil from the pump.

The BRADFORD MACHINE TOOL Co

MANUFACTURERS OF METAL WORKING LATHES; CAM FEED DRILLING AND TAPPING EQUIPMENT, HYDRAULIC DRILLING MACHINES . . . IN BUSINESS SINCE 1840

659 EVANS AVE. . . . CINCINNATI, OHIO



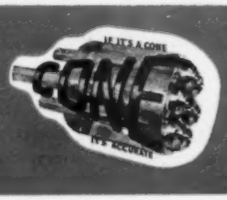


The red portion highlights an outstanding feature of Conomatic design —the cam shaft in the rugged top bed.

It takes four sides to stop the argument concerning accuracy and rigidity of multiple-spindle automatics.

Conomatic design includes a heavy, rugged top bed that completes the all 'round support of the work area — *four sides of* heavy, rugged support for accuracy, rigidity and durability.

***All Conomatics* are readily identified by the overhead cam shaft in the top bed. This construction has a triple advantage — it strengthens the mounting of spindles, auxiliaries, slides and tools — it puts the cams overhead away from coolant, dirt and chips — it affords easy accessibility, resulting in quick changeovers.**



CONE AUTOMATIC MACHINE COMPANY INC.
WINDSOR, VT., U.S.A.

Have you ever considered THESE ADVANTAGES OF G-E MERCURY LIGHTING?

LESS RADIANT HEAT—General Electric MAZDA H (mercury) lamps produce approximately one third the radiant heat per footcandle that filament lamps do. This is important where high levels of illumination are needed.

MORE LIGHT WITH PRESENT WIRING—MAZDA H lamps' high efficiency frequently makes it possible to obtain needed extra footcandles from present lighting circuits.

HIGH EFFICIENCY—The 400-watt MAZDA H lamp delivers about 40 lumens per watt, compared to about 20 lumens per watt delivered initially by the standard 500-watt filament lamp.

LOW MAINTENANCE COST—Because of the 3,000 hour life of MAZDA H lamps, replacements are infrequent—a relatively important factor in high-bay installations where maintenance must be kept down.

COMBINE WELL WITH FILAMENT LAMPS—Mercury lamps alone provide a cool, blue-green light, satisfactory where color discrimination is not a factor. In proper combination, G-E MAZDA C (filament) lamps and G-E MAZDA H lamps provide illumination similar in color to daylight.

Mercury lamps are particularly well suited to lighting steel mills, foundries, erecting shops, and other large industrial areas where high-bay or medium-bay lighting is needed . . . and where swift accurate seeing can speed up production and reduce waste. When installed in proper reflectors, they provide good vertical as well as horizontal illumination.

* * *

For further information about mercury lighting, see your G-E lamp supplier. For a copy of the new 24-page, illustrated booklet "G-E MAZDA H Lamps," giving essential facts about lamps and types of fixtures, write to General Electric Company, Dept. 166-AC-8, Nela Park, Cleveland, Ohio.

G-E MAZDA LAMPS

GENERAL ELECTRIC

THIS IS *the 400-watt (type H-1)* G-E MAZDA *mercury lamp. Actual length is 13 inches. Like other G-E mercury lamps, it has high efficiency, long life, and ruggedness.*

THE MOST RECENT ADDITION *to G-E's line of mercury lamps is a 3000-watt* MAZDA *(A-H9) lamp. Designed for high-bay lighting, this new lamp is four times more powerful than any previous lamp available for general lighting purposes. Rated life: 2000 hours. Rated output: 120,000 lumens.*

P&J AUTOMATIC CHUCKING EQUIPMENT

is mobilized and busy in the Battle of Production

Photo by U.S. Army Air Corps

Many Potter & Johnston Automatic Chucking Machines are enlisted in America's Machine Army in an "all out" effort to serve production.

This physically fit equipment—fast, powerful and easily handled—has been designed and built to anticipate today's needs for maintained accuracy and intensified production of duplicate parts.

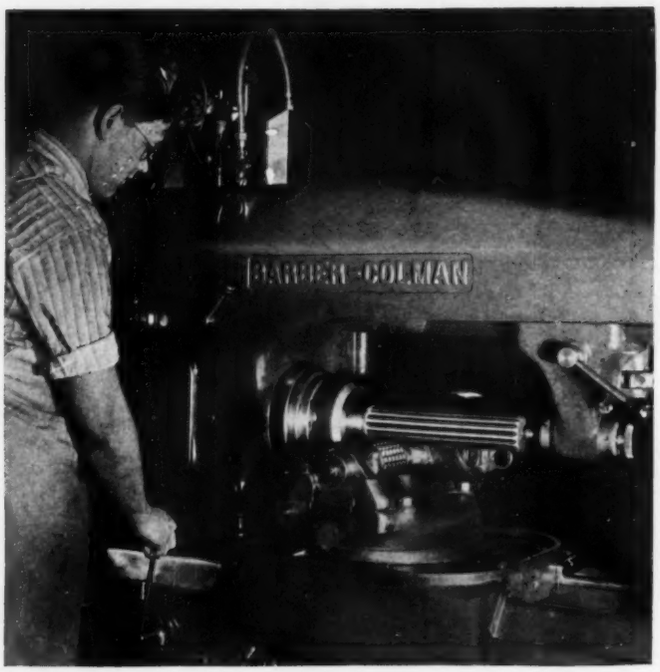
The versatility of P&J equipment is evident from the types of jobs on which it is making big time savings in the arsenals of democracy. Airplanes, airplane engines, tanks, Bofors guns, 90 mm anti-aircraft guns, machine guns, adaptors for shells, the American Oerlikon gun are typical armament products on which P&J equipment is being extensively used.

Potter & Johnston's obligation in the battle of production does not cease when a machine goes on the production line. Our engineers are on the alert at all times to better the best yet attained and if possible achieve the impossible in productivity. We welcome this opportunity to serve.

The POTTER & JOHNSTON MACHINE CO.,

PAWTUCKET . . . . . RHODE ISLAND

LOWER COSTS ON TOUGH SPLINE HOBBING



BARBER-COLMAN TYPE "D" HYDRAULIC HOBBING MACHINE

PERHAPS the most significant feature of this machine in comparison with others of comparable size and capacity, is the fact that it uses a 10 h.p. motor while most of the others use a 5 h.p. motor. This greater driving power means greater metal-removing capacity, and greater production. Greater production is of little value without accuracy and rigidity to meet modern gear-tooth tolerances, so you will find in the Type "D" many distinctive construction features which insure maintenance of a high degree of accuracy. Furthermore, to provide a feed range with infinite variations, for advancing the carriage, for setting and clamping the overhanging arm, and to reduce operator fatigue, HYDRAULIC drive is used. Lead remains a direct product of change gears used.

HOLDS CLOSE LIMITS . . .

The part shown in the above illustration is a tractor axle shaft which must be able to stand heavy shock loads, as well as transmit a considerable amount of power. These conditions require a tough and accurately-machined spline shaft. To insure accuracy, the splines are hobbed after heat treatment to 269-302 Brinell. On the Type "D" machine, production is one shaft every 30 minutes, and the splines are parallel within .004" measured over rolls. This is an excellent example of the production and accuracy obtainable with a Barber-Colman Type "D" Hobbing Machine.

DATA ON THIS SPLINE JOB . . .

Material — 1050 H.R. Steel.

Hardness — 269-302 Brinell.

Splines — 16 splines, 14-7/8" long, 2.121" O.D., 1.791" root dia., involute form, 30° P.A.

Hob Speed — 66 R.P.M.

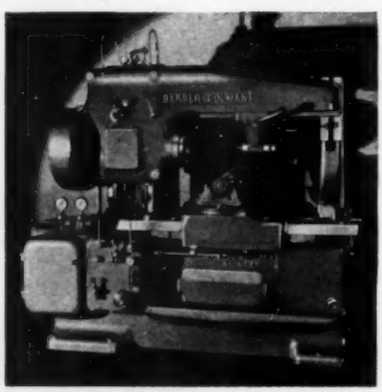
Hob — B-C 3-1/4" x 4" x 2" taper hole, ground, topping, single-thread.

Feed — .082" per rev. of work.

Production — 48 min. per piece, floor-to-floor.

Pieces per Hob Sharpening — 36.

Accuracy — Splines parallel within .000"-.004" measured over .280" rolls. Across individual splines within .001". Spline profile tolerance .0015".



Further details and full specifications on the Barber-Colman Type "D" Hobbing Machine are given in descriptive circulars which will be furnished on request. Ask for Bulletin F1477-1 or consult your Barber-Colman representative.

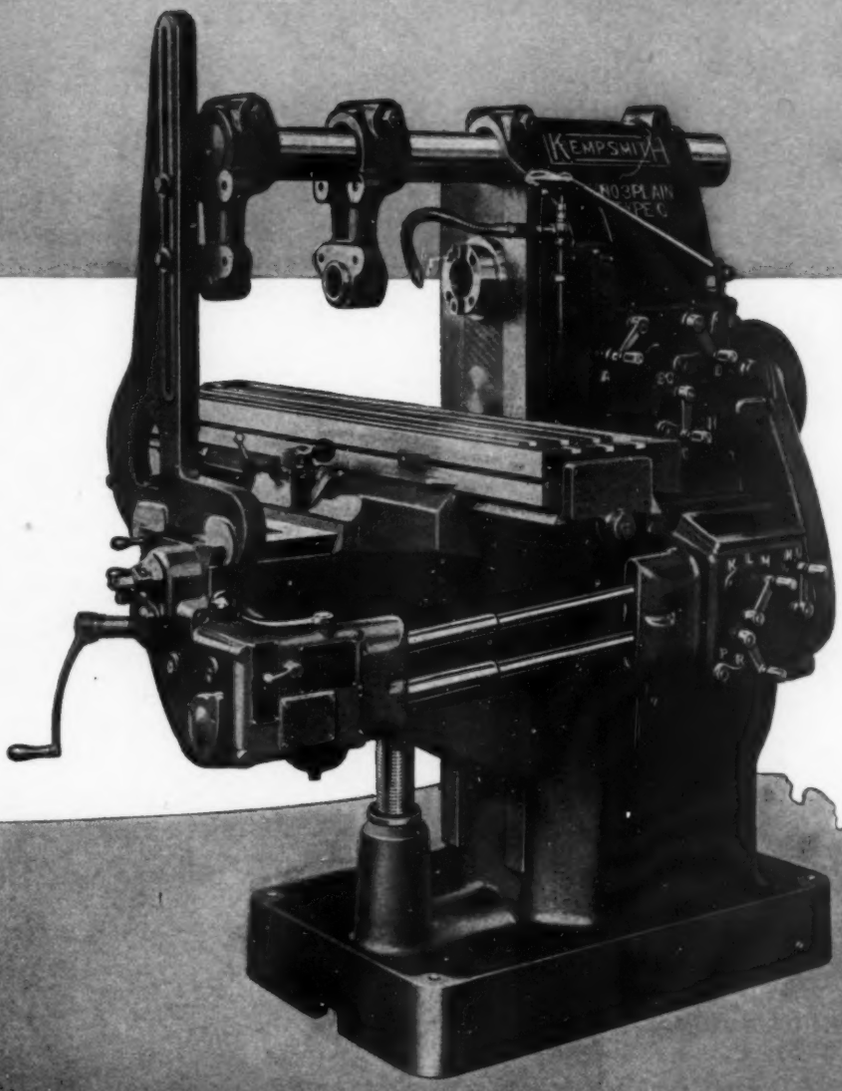
BARBER B-C COLMAN PRODUCTS: HOBS, HOBBING MACHINES, HOB SHARPENING MACHINES, REAMERS, REAMER SHARPENING MACHINES, MILLING CUTTERS, SPECIAL TOOLS

BARBER-COLMAN COMPANY

General Offices and Plant 201 Loomis Street, Rockford, Illinois, U. S. A.

KEMPSMITH *and* INDUSTRY

MUTUALLY MILLING *for* VICTORY



For Toolroom and general production work the new KEMPSMITH TYPE "G" All-Geared MILLER (plain or universal) has centralized control, 18 speeds and feeds (ball bearing speed, feed and spindle assemblies), Knee Gib, Unit Construction, Motor-in-Base . . . and other features that make it precise and reliable, economical in first cost, fast and efficient for PRODUCTION NOW!

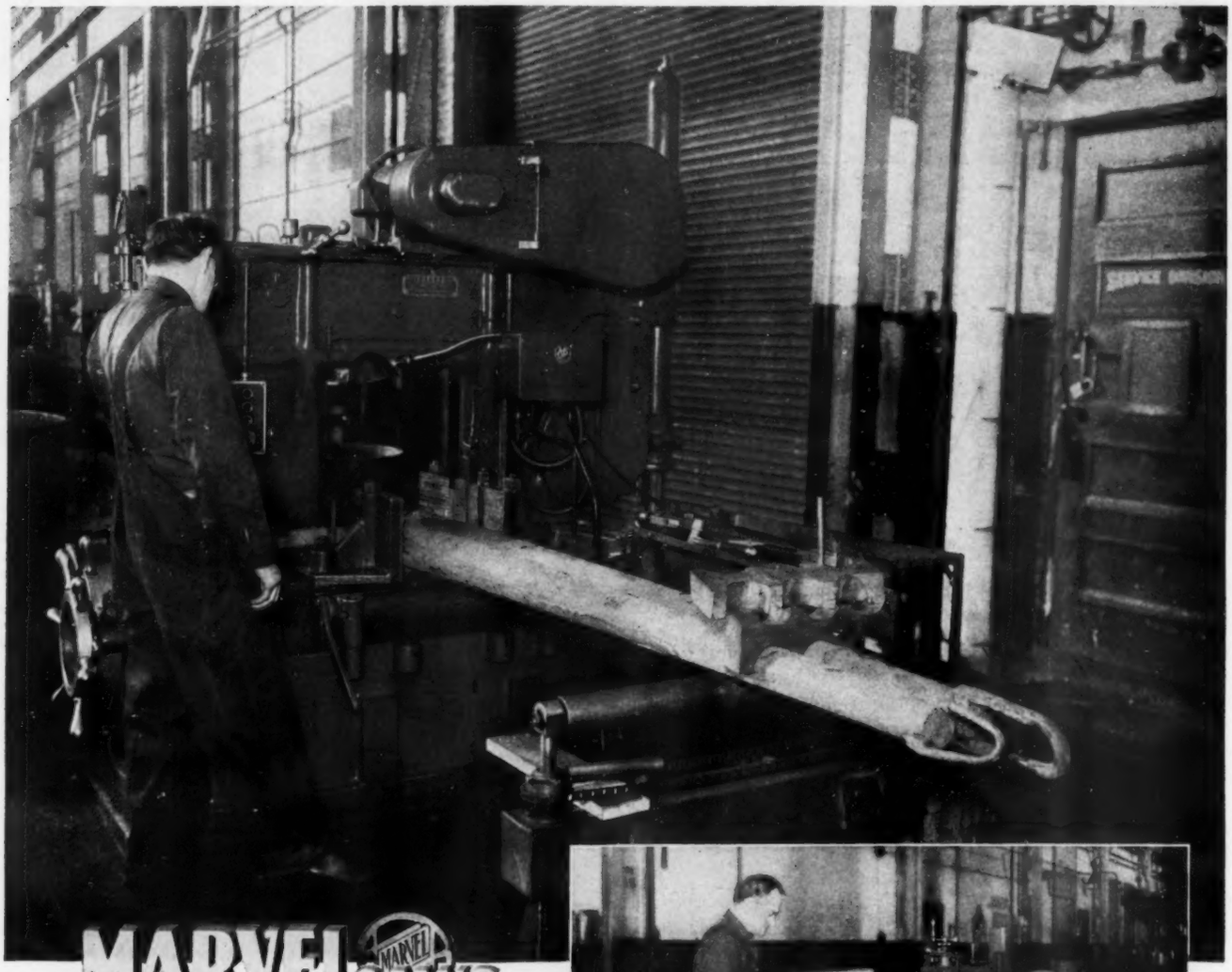
PRECISION

MILLING MACHINERY

Experience SINCE 1888

KEMPSMITH MACHINE CO.

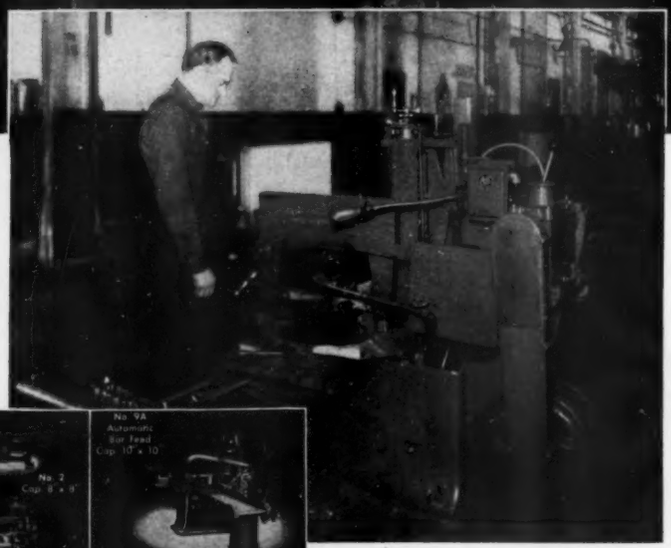
MILWAUKEE • WISCONSIN

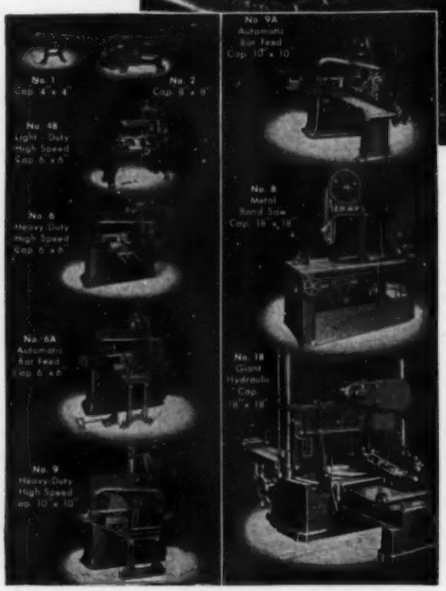


MARVEL SAWS

In the thick of it . . .

In the battle of weapons you will invariably find MARVEL SAWS in the thick of it in private plants, arsenals, armories, airplane plants and ship yards. The MARVEL saws most widely used in armament work are: the No. 18 Giant Hydraulic Saw (above), MARVEL No. 6A and No. 9A High Speed Production Saws equipped with automatic bar push-up, and the universal MARVEL No. 8 metal cutting band saw.





ARMSTRONG-BLUM MFG. CO.

"The Hack Saw People"

5700 Bloomingdale Ave. Chicago, U. S. A.

Eastern Sales Office:
225 Lafayette St., New York

On heavy duty, continuous operation, MARVEL High-Speed-Edge Hack Saw Blades will step-up output by permitting heavier feeds and high speed because they are *positively unbreakable!*

These patented composite hack saw blades (with high speed edge welded to a tough alloy body) will permit any type hack sawing machine to operate continuously at full capacity.

Bardons and Oliver

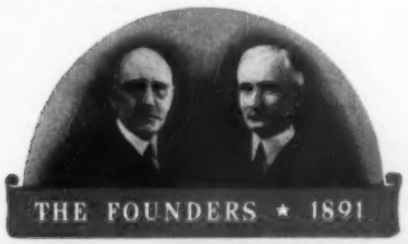
Built to Meet 1942 PRODUCTION DEMANDS!

FAST? The Bardons & Oliver No. 3 Universal Turret Lathe is extremely easy to operate. All control levers can be manipulated conveniently from one control point.

PRODUCTIVE? The powerful drive, together with the sturdy construction makes it easy to take several cuts simultaneously.

FLEXIBLE? The machine is exceptionally well adapted to a large range of variety of bar, chucking, or second operation work.

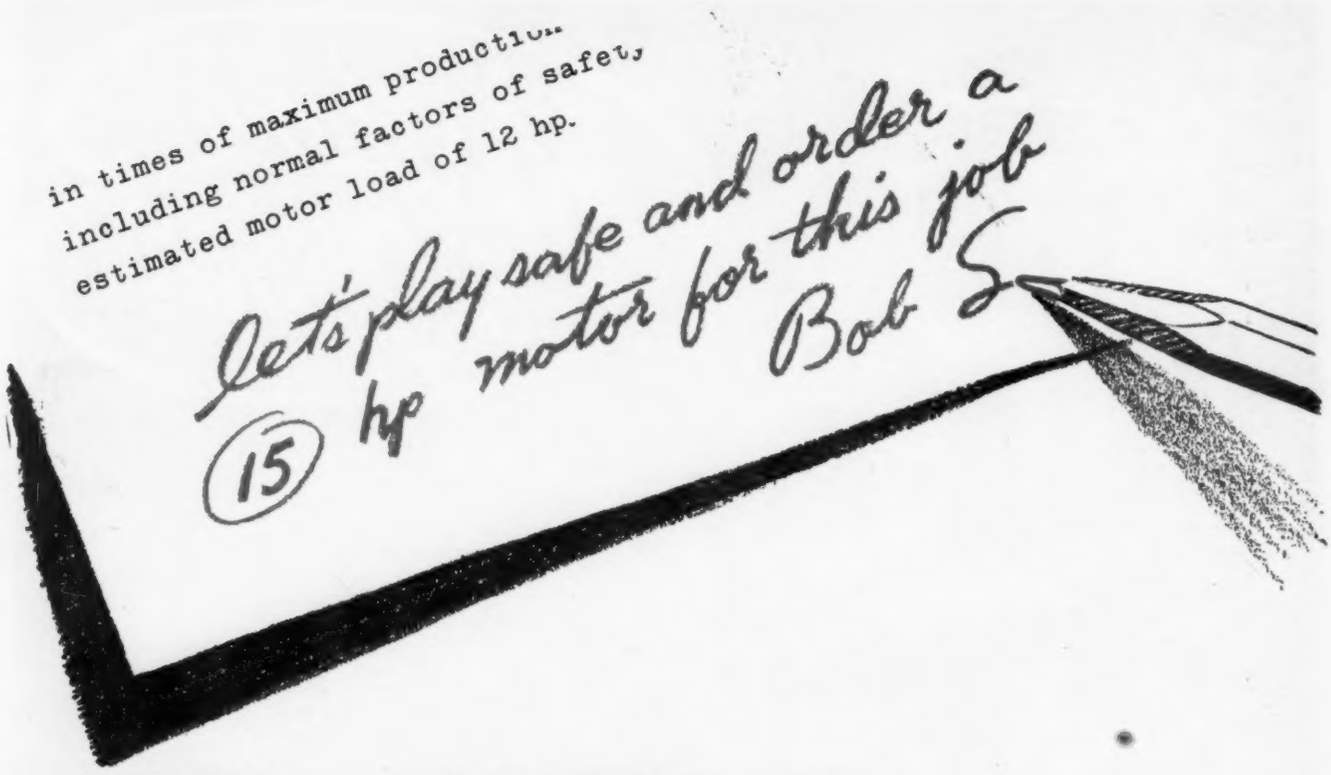
ACCURATE? Because of the close work tolerances that can be held, this machine is a favorite for work on Airplane parts.



THE FOUNDERS ★ 1891

BARDONS & OLIVER, INC.

1133 W. 9TH ST. . . CLEVELAND, OHIO


in times of maximum production
including normal factors of safety
estimated motor load of 12 hp.
let's play safe and order a
15 hp motor for this job
Bob S

GENERAL ELECTRIC asks:

"Will you help save 25% in critical materials by modifying your peacetime motor policy?"

IN PEACETIME, your engineers as well as our own have generally advocated motors having a generous capacity for the job. Such "overmotoring" was then justified as a safety factor to take care of unexpectedly heavy loads, and as a means of extending motor life to 20 years, say, instead of 10.

But today, every pound of steel, copper or aluminum tied up by the use of motors needlessly large for the job is one less pound to help beat the Axis. You can help save these materials by selecting motors strictly on the basis of the ***actual expected*** load, without additional safety factors. If in doubt, do not select arbitrarily the "next larger rating." Often, the "next smaller rating" will handle the job satisfactorily.

Because of better design modern motors are considerably lighter than those of a few years ago, but they are just as ***conservatively rated.*** This means that a margin of safety to meet reasonable overloads has already been "figured in" by the manufacturer. When another safety margin is allowed by the buyer, needless overcapacity is the result.

Why not check with your engineers to see if your motor specifications can be modified in the cause of conservation? You'll be helping to get more motors into war production, and make more metals available for winning the war. General Electric Company, Schenectady, N. Y.

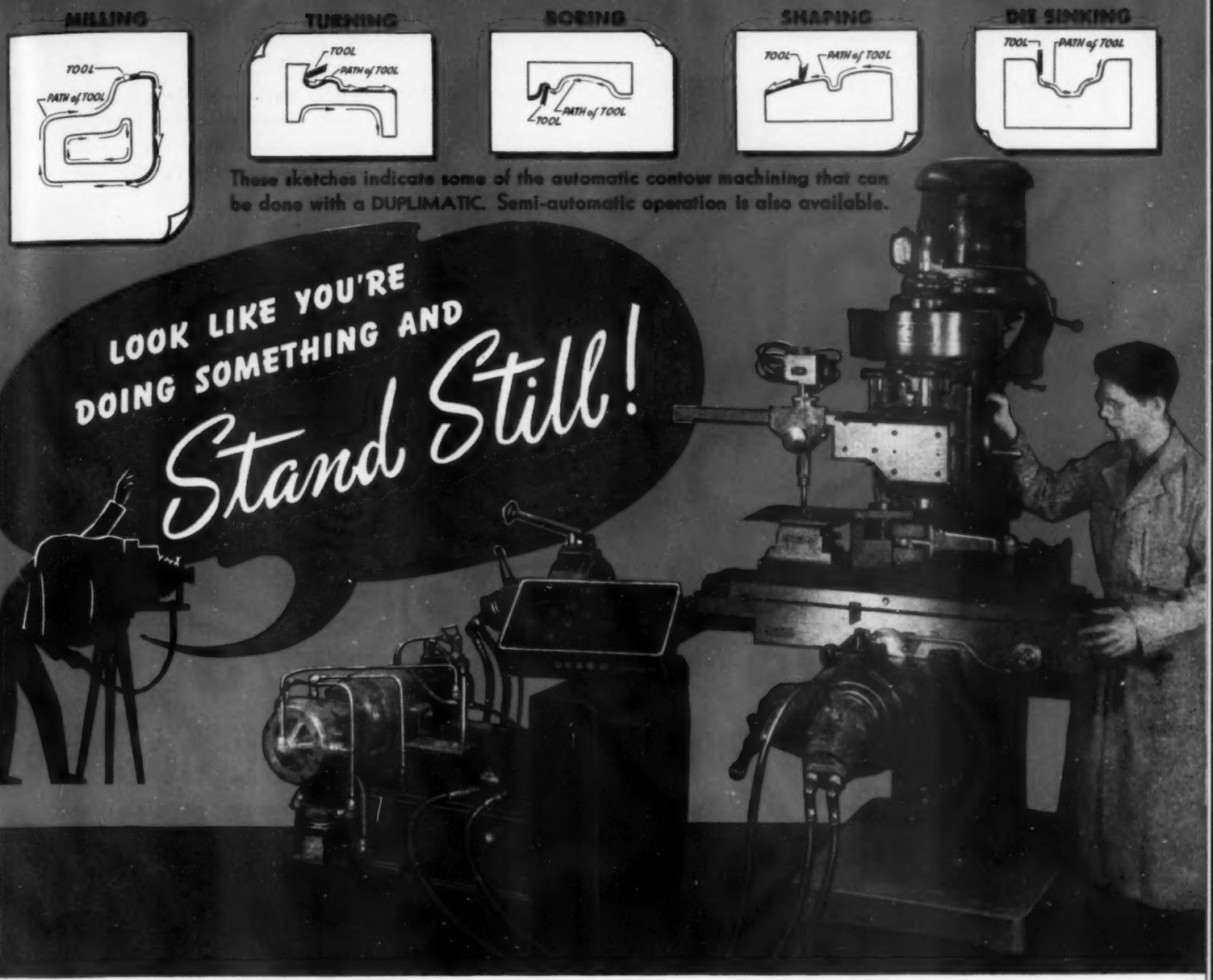
The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in five plants manufacturing naval equipment.

STANDARD G-E MOTORS ARE GENERALLY AVAILABLE WITHOUT DELAY FOR WAR JOBS

BUILDER OF TRI/CLAD MOTORS
REG. U.S. PAT. OFF.

GENERAL ELECTRIC

LET'S MAKE EVERY MAN-HOUR OF WAR EFFORT PRODUCE MAXIMUM RESULTS



• • the photographer said. And while the operator leaned gainst the machine and looked awkward, this contour milling peration continued at full speed!

hen a DUPLIMATIC is attached to any machine tool—such as is vertical mill—all an operator does is load the work and sh a button! The rest of the operation is automatic.

WHAT'S A DUPLIMATIC?

e Dual DUPLIMATIC is a separate, self-contained machine ol control mechanism. It is used with your present tool room ols. It is moved alongside any engine or turret lathe, boring ill, shaper or vertical mill and connected with any two feed rews in one day's time. The following day the operator of at machine—or another operator even less skilled—should **crease production by 7 times . . .** (an average.)

the vertical mill illustrated, it turns the two feed screws tomatically *and* simultaneously, thereby generating a smooth ntour. (It is the only control that can turn two or three rews simultaneously.)

High Speeds at Tool Room Accuracies

Because DUPLIMATICS can quickly convert tool room machine tools into high production speed automatic operation without any sacrifice in accuracies, DUPLIMATICS have been accepted as standard in the biggest war production plants. Contour machining which DUPLIMATICS control include: **TORPEDOES—BOMBS—GUN PARTS—AIRPLANE ENGINE PARTS—TANK TURRETS—ANTI-AIRCRAFT GUN PARTS—AIRPLANE LANDING WHEELS . . .** on all of these, scrapped parts have been reduced, hand-finishing cut and accuracies easily held.

Send now for information. If possible, send a sketch or print of the work.

This is DUPLIMATIC and DUPLIMATIC is MASS PRODUCTION

Twist Drills—Milling Cutters —Reamers—Hobs—Slittings Saws—End Mills—Taps—Dies —Screw Plates—Profile Cutters—

EVERY SMALL TOOL JOB IS AN OPPORTUNITY FOR A SAVING

Completeness of the UNION line makes it possible to realize BIG SAVINGS on many operations. Milling, drilling, reaming, hobbing, slitting, tapping, threading, cutting can be speeded up and costs reduced by these modern, fast, accurate tools.

Cost minded production men know from experience that UNION tools can always be depended on for economy and increased cutting efficiency over long periods between grindings.

Because of the wide range of tools in the UNION line, with each tool designed for maximum results, standardization on UNION tools can mean an overall total saving of substantial proportions. Put UNION tools to work and see for yourself.

UNION
TWIST DRILL COMPANY
Athol, Mass.

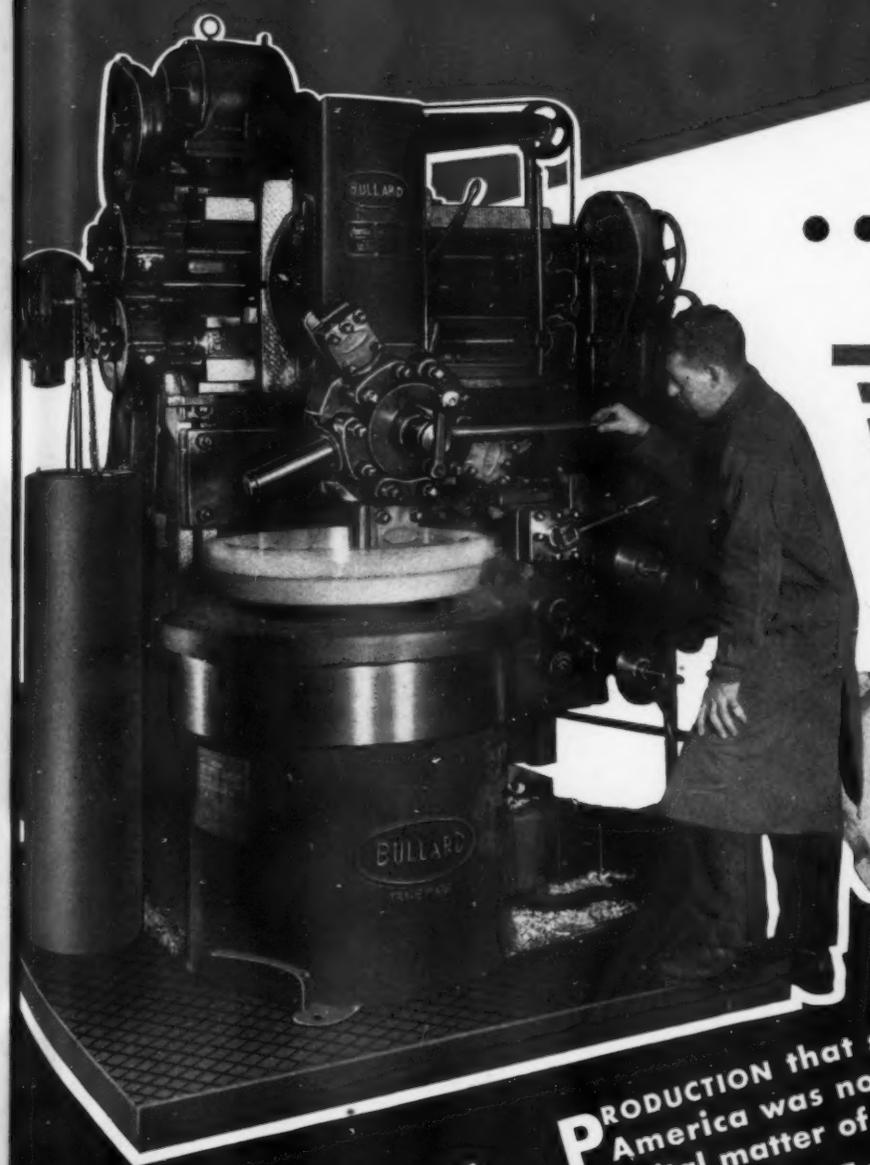
STORES New York Store: 61 Reade St.; Los Angeles Store: 524 East Fourth St.; Chicago Store: 11 So. Clinton St.; Seattle Store: 568 First Ave., So.; San Francisco Store: 121 Second St.; Detroit Store: 6540 Antoine St.

MANUFACTURING DIVISIONS
S. W. Card Mfg. Co., Div.; Mansfield, Mass.
Butterfield Division, Derby Line, Vt., and Rock Island, Quebec

Representatives throughout the world

UNION

VICTORY THROUGH LABOR



... calls for V.T.L.s.

PRODUCTION that staggers belief is proof that America was not "too late, with too little" in the vital matter of machine tools.

Bullard Vertical Turret Lathes in many thousands of American, British and Russian shops are speeding the day of Victory through labor.

They cut machining time, and time between cuts. They multiply individual output, and reduce over-all time throughout the whole field of armament building.

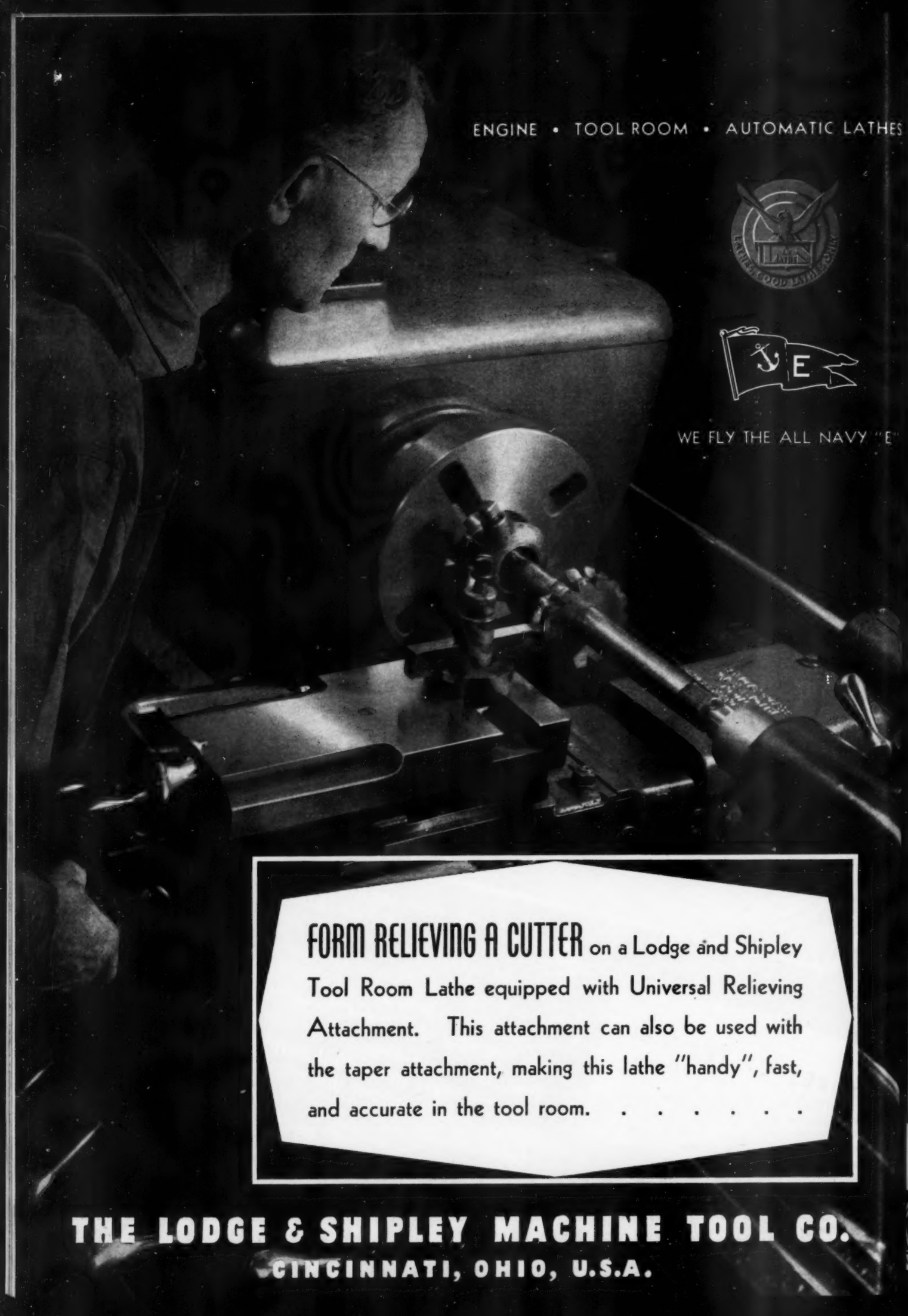
A few of the "V" features of V.T.L.s are listed below.

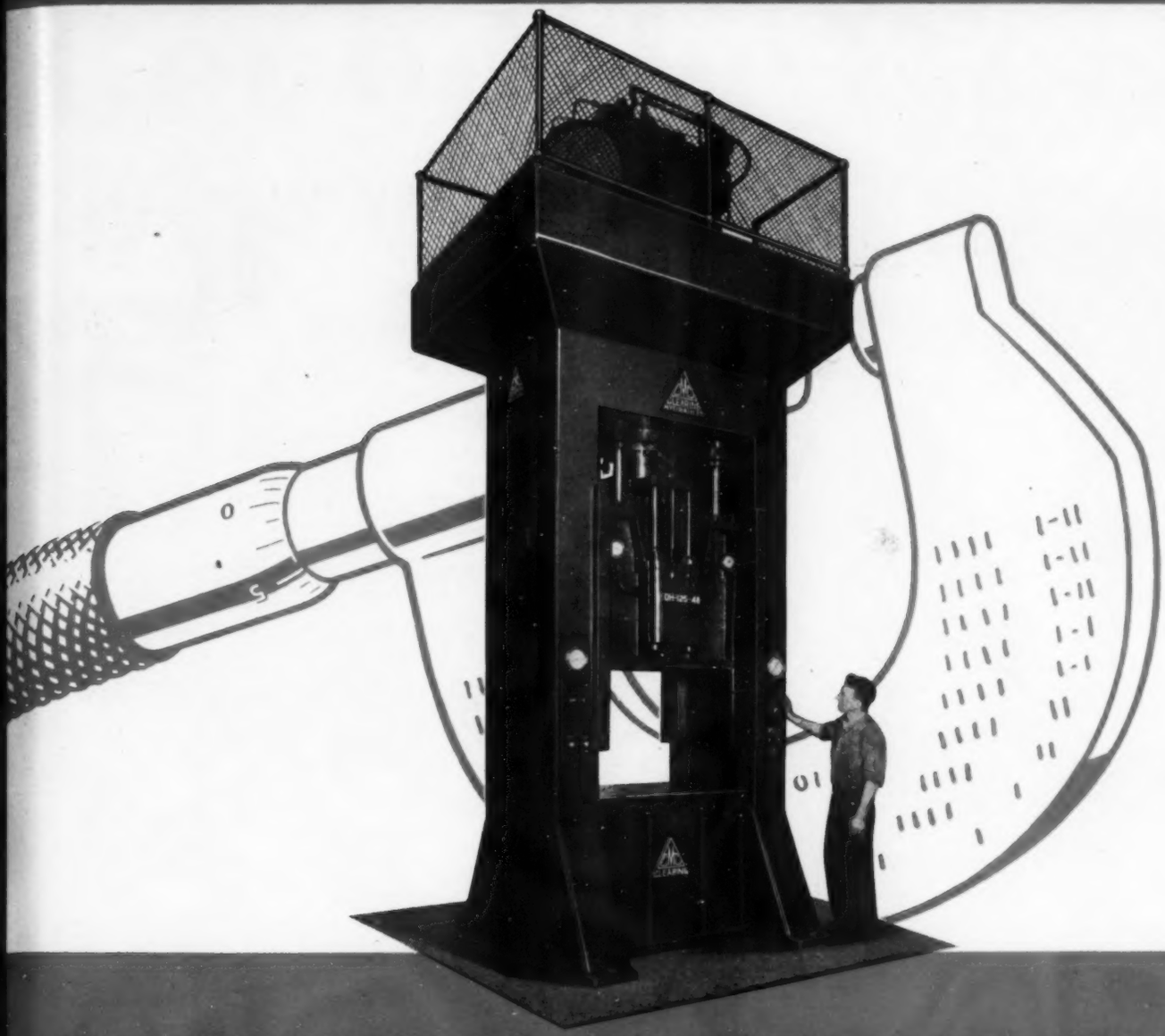
"V" FEATURES OF THE V.T.L.

- Vertical Design
- Rigidity and Power for Carbide Tools
- 5-Face Turret on Main Head
- Centralized Control
- Rapid Power Traverse of Main Head
- 4-Tool Turret on Side Head
- Simultaneous and Independent Head Action

THE BULLARD COMPANY

BRIDGEPORT, CONNECTICUT


ENGINE • TOOL ROOM • AUTOMATIC LATHES
WE FLY THE ALL NAVY "E"
FORM RELIEVING A CUTTER on a Lodge and Shipley Tool Room Lathe equipped with Universal Relieving Attachment. This attachment can also be used with the taper attachment, making this lathe "handy", fast, and accurate in the tool room. . . . . .
THE LODGE & SHIPLEY MACHINE TOOL CO.
CINCINNATI, OHIO, U.S.A.



FOR PRECISION DRAWING AND FORMING OF AIRPLANE PARTS

CLEARING

DOUBLE ACTION HYDRAULIC PRESS

These CLEARING Presses have Operating Features you always wanted but could not obtain.

CHECK THESE POINTS:

★ Individually adjustable clamping pressures from zero to maximum, in each corner of the blankholder, controlled from floor level.

★ Instantaneous build up of clamping pressures when the blankholder contacts work and uniform maintenance of the pressures during draw stroke.

★ Die Cushions, built into bed are substantially guided and have automatic holding valve.

The CLEARING Hydraulic Line includes Four Column presses with Rubber Pads, and Hydraulic Loading Trucks with built in pumps for accelerated and decelerated loading and transfer stroke.

Clearing Machine Corporation
6499 West 65th Street, Chicago, Illinois

MECHANICAL AND HYDRAULIC PRESSES

CLEARING

MACHINE CORPORATION

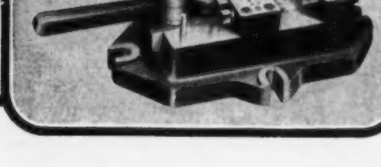
CHICAGO

Rolling into Action!

The manufacture of tank parts is only one of the jobs that Fenn is doing day and night. Our entire capacity is engaged in the manufacture of essential war parts. Our long experience in the production of special machinery is being successfully applied to turning out fighting machinery.

When guns are stilled and peace comes, we will return to the manufacture of the tools and machinery needed for consumer products — better equipped than ever to work on new designs with the new metals and materials that are being developed under the stress of war

ACME PHOTO



The Fenn Manufacturing Co.

HARTFORD, CONNECTICUT - - ESTABLISHED 1900

Round the World Every 8 Days

THAT'S THE RIM-TRAVEL of a rotor in many electric motors working on the new 24-hour-a-day, 7-day-a-week Victory schedule!

And keeping 'em rolling at *that* rate is no job for maintenance, peace-time-style!

Figure it out . . .

With no quitting time for motors — no holidays — their working time has shot up from 1800 hours a year to *8700* hours a year. That's a *4-time* increase.

Maintenance, too, must be quadrupled!

And *quality* of motor care must now be finer. So long as free men wait for guns to defend themselves, shutdown costs must be measured in human lives.

Thus the vital importance of "A Guide to Wartime Care of Electric Motors" — published by Allis-Chalmers and free for the use of U. S. industry. Tear out the order form below and send in for *your* free copy today.

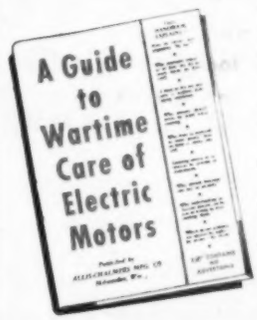
All-out Production depends on All-out Maintenance. Get this free Book →

Here's the answer to the question, how to keep motor maintenance in step with hustling war production? And it's a *clear* answer!

You'll find "A Guide to Wartime Care of Electric Motors" liberally illustrated — *interesting reading*—a great help in training new men in your plant.

This handbook contains no advertising. It applies to *all* makes of standard, general-purpose motors — is *packed* with useful facts.

Every engineer production manager, maintenance man and executive should have "A Guide to Wartime Care of Electric Motors" in his technical library.



ALLIS-CHALMERS MFG. CO.
Advertising Dept.
Milwaukee, Wisconsin

Gentlemen:

Yes, I would like to receive *free of charge* "A Guide to Wartime Care of Electric Motors" . . .

(Name)

(Title)

(Company)

(Street Address)

(City and State)

A 1534-2

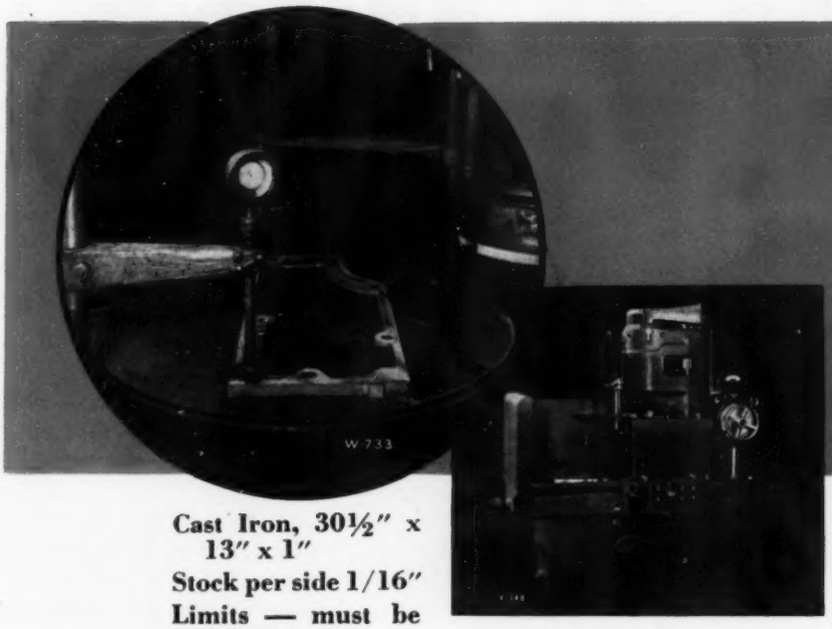
ALLIS-CHALMERS

MILWAUKEE-WISCONSIN

WE WORK FOR VICTORY — WE PLAN FOR PEACE

"PUT IT ON THE BLANCHARD"

BLANCHARD



Cast Iron, 30½" x 13" x 1"
Stock per side 1/16"
Limits — must be parallel
Number of Sides 2
2 pieces (4 surfaces) per hr.

Here the easiest way is also the best. This is a difficult job to do any way but on a Blanchard. The piece is of thin section and apt to spring if it is locked in a fixture strongly enough to hold it. The piece is shimmed the first time and a clean-up cut is taken. It is then turned over and a light cut taken on the other side. This operation is repeated four or five times before it is finished.

CHECK THESE ADVANTAGES OF BLANCHARD GRINDING

Production

Adaptability

Fixture Saving

Operation Saving

Material Saving

★ **Fine Finish**

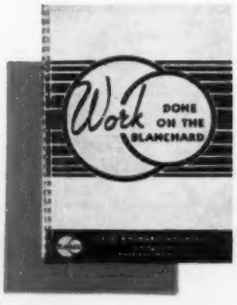
★ **Flatness**

Close Limits

★ . . . . . *Especially valuable on jobs like the one illustrated.*

The BLANCHARD MACHINE COMPANY

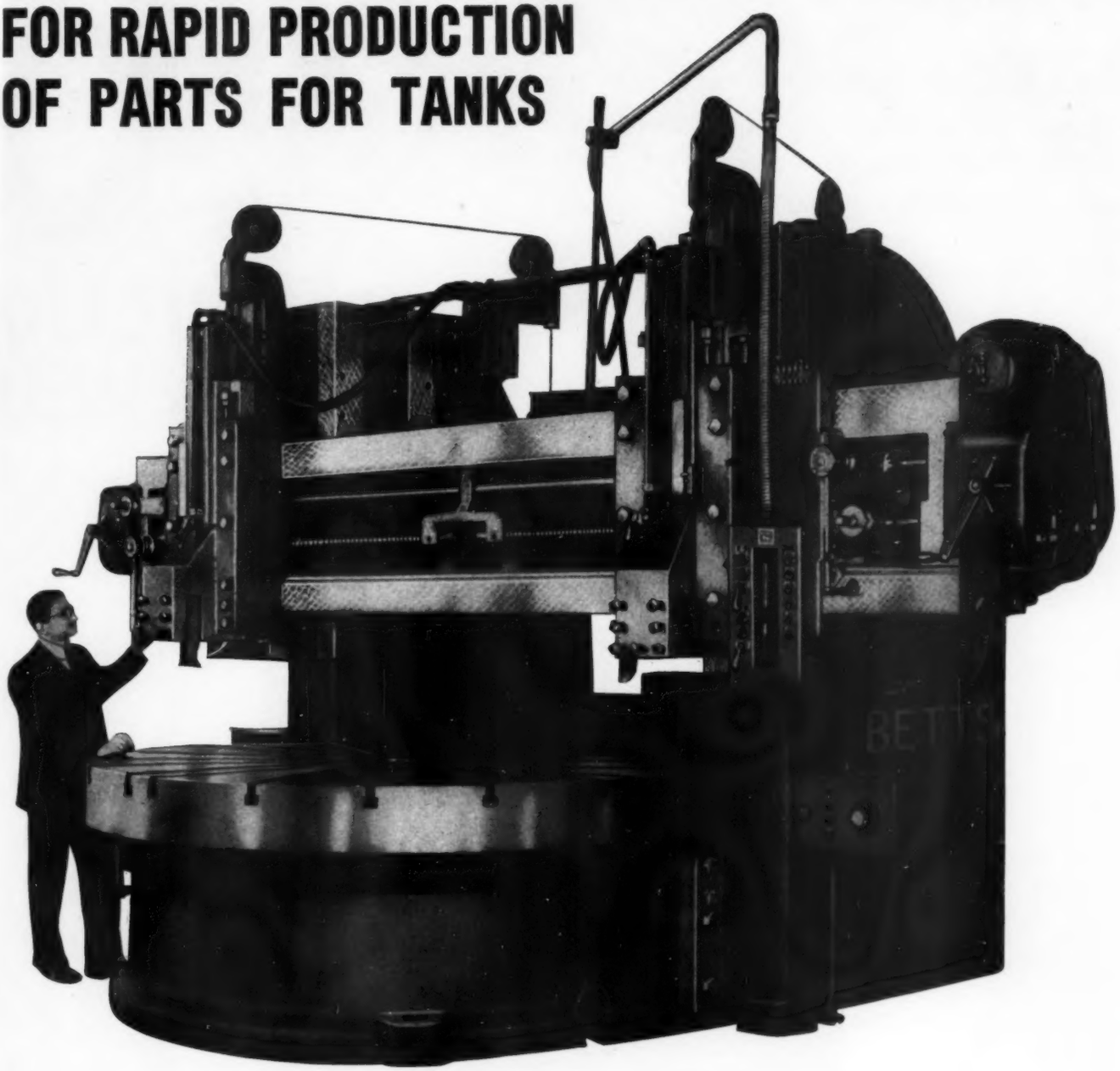
64 STATE STREET, CAMBRIDGE, MASS.



Send for your free copy of "Work Done on the Blanchard." This book shows over 100 actual jobs where the Blanchard Principle is earning profits for Blanchard owners.

BETTS TANK MILLS

FOR RAPID PRODUCTION OF PARTS FOR TANKS



The machine shown above is known as a 100" Tank Mill. It is so named because it was planned for the mass production of parts for tanks. In designing this machine there were two principal factors involved, first—a construction which would permit building the machines on a quantity basis thus permitting quick deliveries; and second—a construction insuring the utmost in productiveness of parts for tanks.

BETTS • BETTS-BRIDGEFORD • NEWTON • COLBURN • HILLES & JONES • MODERN

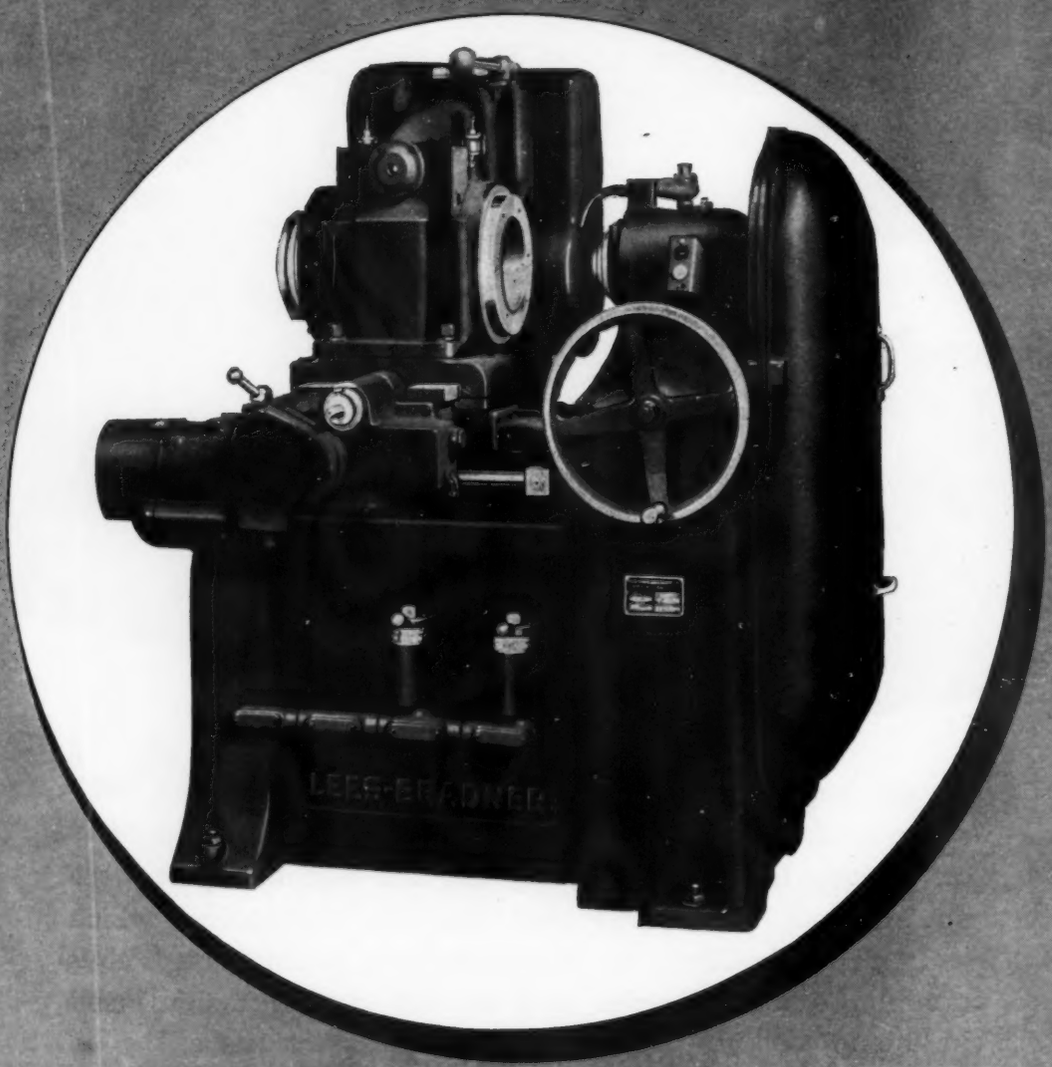
CONSOLIDATED
MACHINE TOOL CORPORATION
ROCHESTER, NEW YORK

LEES-BRADNER *Model* 40

PRODUCTION THREAD MILLER

The Model 40 Production Thread Miller, a tool built by an Organization long familiar with the demands of high production, presents an ideal solution to your threading problems.

The Machine is particularly suited to present day requirements, since with it superb threads can be produced . . . even with relatively unskilled labor . . . because of the automatic functioning of the machine.

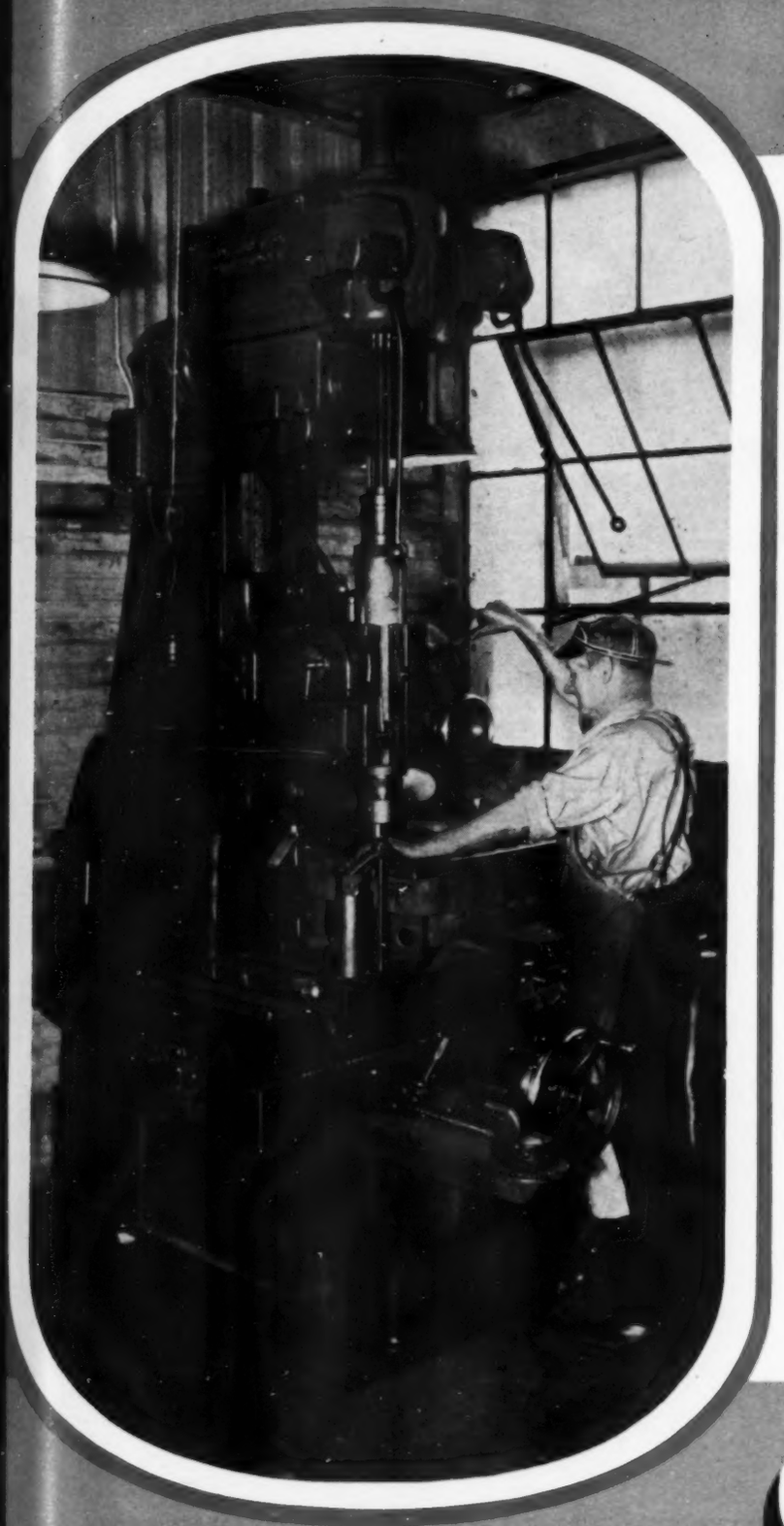


The LEES-BRADNER *Company*

CLEVELAND, OHIO, U.S.A.

FOSDICK

JIG BORER



makes versatility an ally of accurate production

● The ease with which this machine may be set up and changed over from one job to another is of particular interest today when job requirements demand both accuracy and versatility to meet the urgency of war production.

Simple to operate—does not require highly trained help—yet operators find it convenient and easy to produce exceptionally close tolerance work.

Fosdick Jig Borers are being used extensively in the Tool & Die Shops of America —making jigs—fixtures and special tools to speed production of badly needed war materials.

Here's a machine that has all-around utility from the tool room to the production shop and requires only a moderate investment.

If it's a Jig Borer job put it on a Fosdick — for speed — accuracy and downright economy.

ITS MANY ADVANTAGES

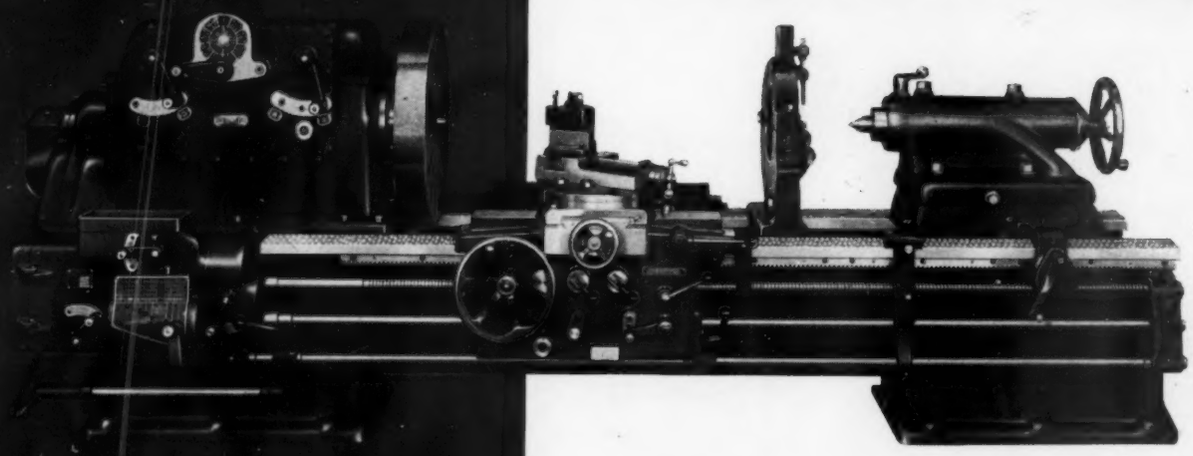
and mechanical details of construction are fully covered in Fosdick Jig Borer Bulletin J.B.A. Send for your copy today.

FOSDICK MACHINE TOOL COMPANY

CINCINNATI ··· OHIO

SPEED and POWER

SIDNEY 30" 36" LATHE



SIDNEY
THE SIDNEY MACHINE TOOL CO., SIDNEY, OHIO, U.S.A.

FEATURES

Center bearing on spindle and intermediate shaft.

48 changes of threads from ¾ to 46 per inch.

48 changes of feeds from .003" to .207" per revolution of spindle.

Force feed lubrication to headstock—apron mechanism—carriage and bottom slide.

Twin-disc driving clutch and brake

Double Wall Apron with anti-friction bearings and force feed lubrication.

16 Speed HERRINGBONE GEARED HEAD

This exclusive headstock design provides sixteen selective spindle speed changes with continuous tooth herring bone gears that are in constant mesh. Various speeds are obtained by engagement of sliding clutches operating on multiple spline shafts. Spindle is made of alloy steel forging, heat-treated and mounted on Timken Precision Bearings which take both radial and thrust loads and insures a true running spindle under most severe demands.

The **SIDNEY MACHINE TOOL** *Company*

SIDNEY U.S.A. OHIO

HIGH SPEED PRECISION LATHES

Extreme precision is vital in the manufacture of gages. Because of this fact, the Sheffield Corporation, Dayton, Ohio, like their HARDINGE High Speed Precision Lathes with preloaded ball bearing spindle construction.

Read what Fred Markwick, Gage Manufacturing Manager of the Sheffield Corporation says:

"Hardinge Precision Lathes do an excellent job. They are very dependable and accurate."

A partial list of the precision gages manufactured by the Sheffield Corporation is:

Visual Gages; Electricheks; Multicheks; Precisionaires; Guidegages; Thread Gages, Plug, Ring , Snap Gages; Special Gages; Spline and Serration Gages; Thread Lead Checking Instruments.

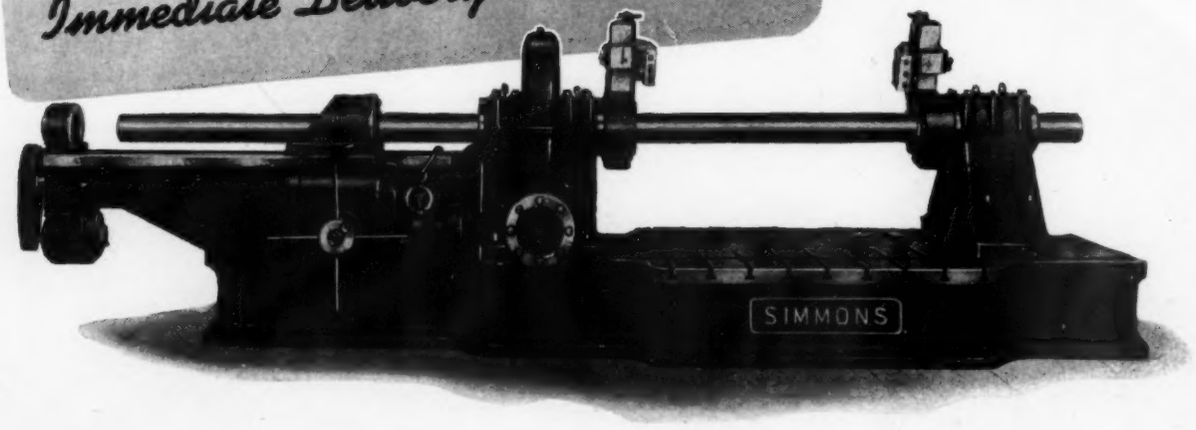
HARDINGE BROTHERS, Inc. · · · ELMIRA, N. Y.

"PERFORMANCE HAS ESTABLISHED LEADERSHIP FOR HARDINGE"

SIMMONS 6" BAR HORIZONTAL BORING AND FACING MACHINE

Immediate Delivery with 17' Bar

Equipped with SIMMONS *MICRO-FEED* UNIT



THIS new Simmons 6" Bar Horizontal Cylinder Boring and Facing Machine has been designed specifically to solve current war-production problems. The bed, which is of massive construction, is heavily ribbed to insure maintained alignment.

Equipped with Simmons Micro-Feed Unit, an infinitely variable transmission, this boring machine offers both fine and coarse feeds ranging from .004" to 1.000" per revolution of spindle. The boring bar is of turned and ground high-carbon steel, thoroughly normalized, with Brinnell hardness of approximately 220. Standard length of the boring bar is 17', but lengths up to 24' may be provided.

The main drive to the boring bar is obtained through a six-speed gear box, motor-driven. Gears are of high-carbon steel and mounted on spline shafts with anti-friction bearings running in oil. Power Rapid Traverse is supplied to the bar in both directions. *Write today for descriptive bulletin.*

SPECIFICATIONS

Diameter, Boring Bar	6"
Travel of bar in one setting	60"
Capacity of facing heads	9" to 38½"
Widened portion of bed	51½" x 68", 18" high

SIMMONS MACHINE TOOL CORPORATION

Main Office: **1759 NORTH BROADWAY, ALBANY, N. Y.** ***New York Office:*** **149 BROADWAY**

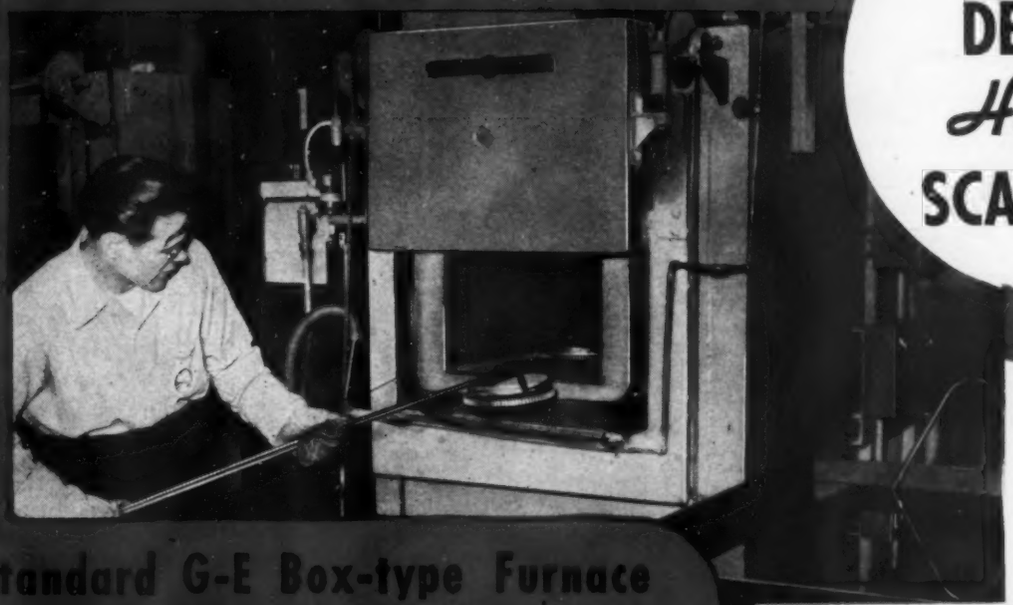
SIMMONS

LATHES · TURRET LATHES · MILLERS · PLANERS · 6" BAR BORING MACHINES

ARE YOU LOSING TIME

CLEANING, MACHINING, and GRINDING?

Prevent
DECARB!
Harden
SCALE-FREE



MANY TYPES of parts in various industries are now being heat-treated decarb-free by such installations as this one. Here gears are being treated in an engine plant.

Use a Standard G-E Box-type Furnace *with* DRYCOLENE

Where scale-free hardening without decarburization is required, where saving time is an important factor, where uniform hardening is demanded, G-E box-type furnaces with drycolene are doing the job.

Used with drycolene, an atmosphere gas that prevents decarburization of carbon and alloy steels, this type of furnace gives you work that is free of scale and decarburization. The parts come out clean. This eliminates costly cleaning and machining operations—saving valuable time.

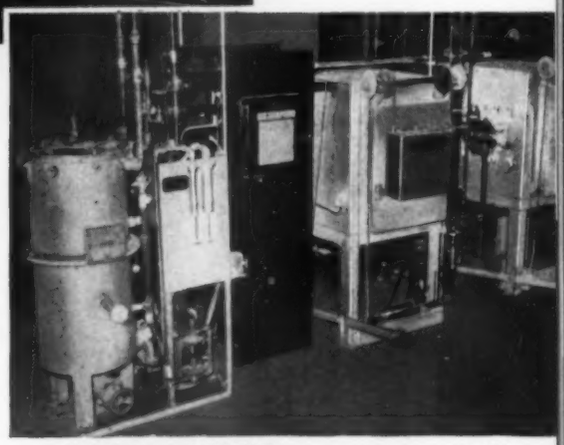
A high-velocity flame curtain projects upward across the furnace throat and guards against atmosphere losses. This prevents the entrance of air and loss of drycolene when the furnace door is opened.

A separate compensating circuit distributes the heat uniformly throughout the loading space, while another circuit automatically regulates the temperature. That's why the parts are uniformly heated.

Easy operation is another feature of these furnaces. The composition of drycolene and its flow into the furnace are maintained automatically. No attention is required by the operator. Maintenance is low.

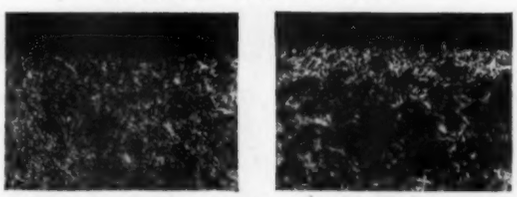
Although designed primarily for use with drycolene, this line of furnaces can also be used with other types of atmosphere gases.

Whenever you have a heat-treating problem, get in touch with the nearest G-E office. Our engineers will make a study of it, and recommend the right furnace for the job, selected from dozens of tested and proved G-E heat-treating equipments that are available. *General Electric Co., Schenectady, N. Y.*

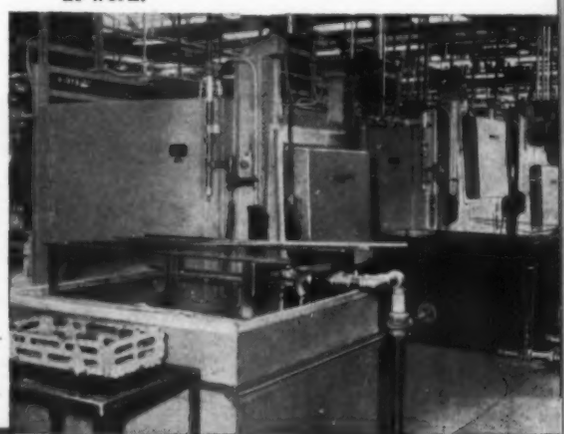


UNIFORMLY HARDENED parts are assured by heat-treating in G-E box-type furnaces with drycolene. Here are a preheat furnace and a high-speed furnace and a drycolene producer at work.

HERE'S THE PROOF



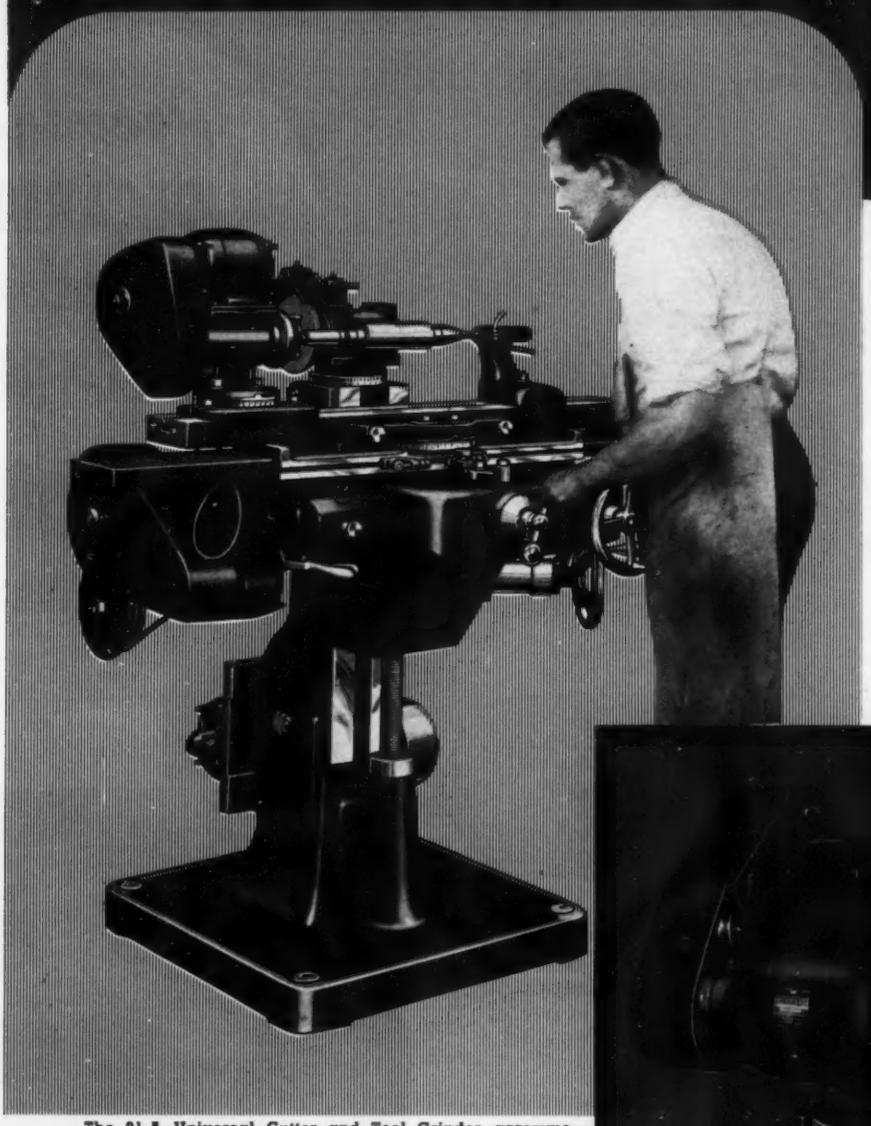
Compare these photos. **Left** shows SAE 52100 after 2 hours, 1500 F. in furnace using drycolene as protective atmosphere. Absolute uniformity of structure extending to surface is proof of no decarburization. **Right** shows same steel after 2 hours, 1500 F. in furnace using partially converted gas as protective atmosphere. White band at the surface indicates carbon-free ferrite and is proof of decarburization.



THIS METHOD of decarb-free hardening has proved so satisfactory that many manufacturers have installed several of these furnaces with drycolene producers.

The Navy "E", for Excellence, has been awarded to 92,780 General Electric employees in five plants manufacturing naval equipment

GENERAL ELECTRIC



The 91-A Universal Cutter and Tool Grinder accommodates this *3-Speed Motor Driven Headstock*—one of the many Covel *extra production* Attachments.

WITH tools and equipment at a premium, extra "ability" is as important with machines as with men! With its attachments, this widely popular Covel No. 91-A Universal Cutter and Tool Grinder handles a score of jobs beyond the scope of ordinary tool grinders . . . That's why it can be important to *your* war work.

Prompt delivery can be made to War Industries on this Covel No. 91-A Universal Cutter and Tool Grinder. Write, wire or phone today for name of nearest dealer and copy of Bulletin A-862.

Grinding Machinery Since 1874

COVEL INDUSTRIAL GRINDERS

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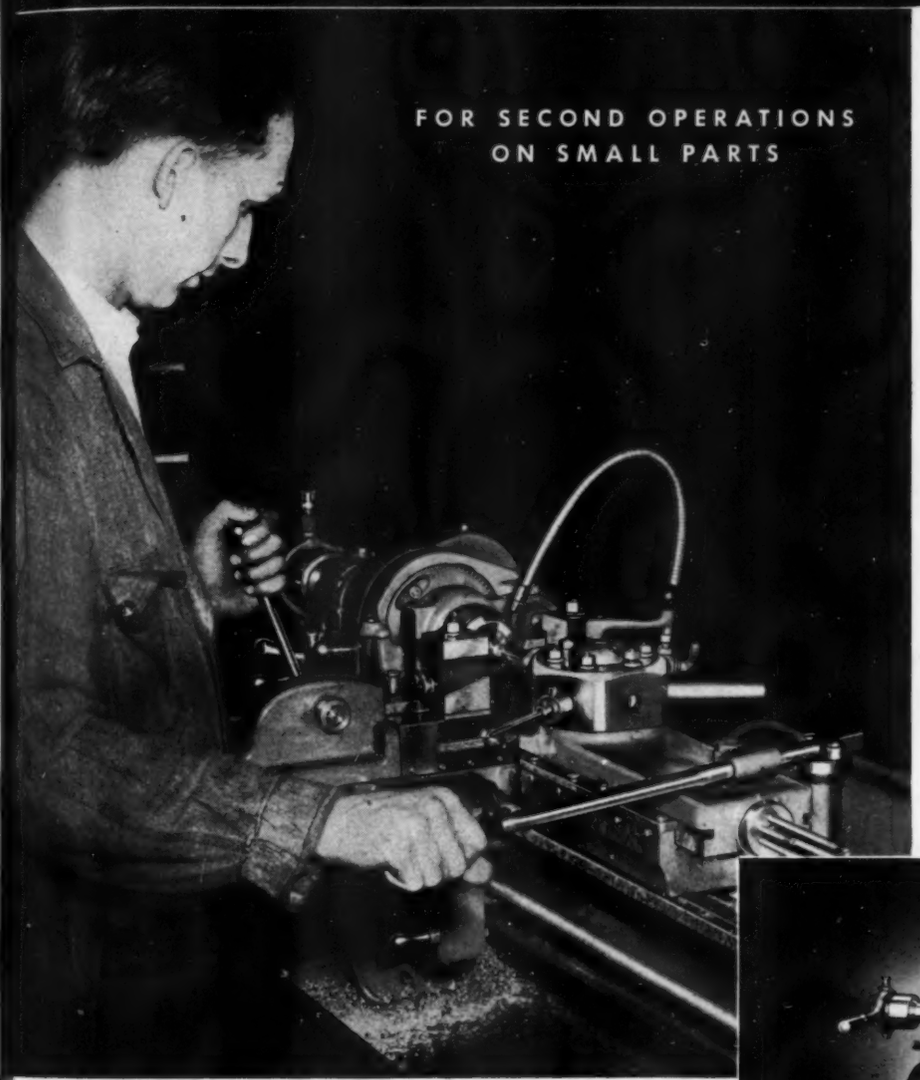
New SOUTH BEND TURRET LATHES



Designed for the rapid machining of small duplicate parts, the new Series 1000 South Bend Turret Lathes are especially adaptable to second operation work. Their speed, accuracy and versatility make possible rapid production without sacrificing efficiency or precision.

Features that contribute to the versatility and efficiency of these lathes are the smoothly operating handlever bed turret, the handlever cross slide with double tool blocks, the compound cross slide with power longitudinal feeds and power cross feeds for the universal carriage, forty-eight precision thread cutting feeds driven by a lead screw, and a wide range of spindle speeds.

The handlever bed turret indexes automatically on the return stroke and is equipped with an adjustable feed stop for each face. The handlever cross slide has adjustable stops for both the front and back tool blocks. Standard extras simplify tooling this lathe for war production and make it easily convertible to other work when peace comes.

Series 1000 Turret Lathes

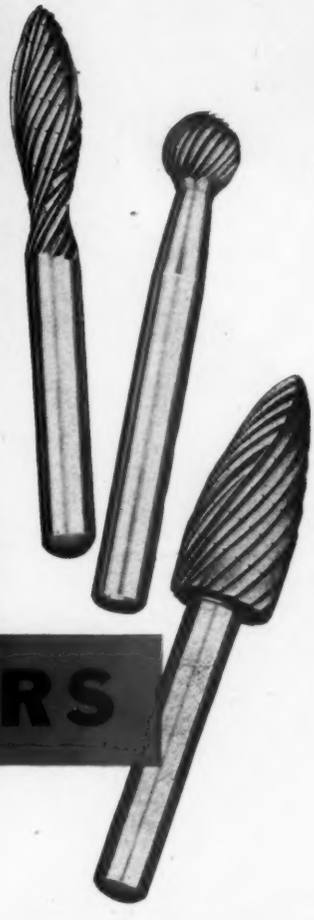
The Series 1000 Turret Lathes have a 1⅜″ spindle hole, 10⅛″ swing over bed, and 1″ maximum collet capacity. They are made in bench and floor types—with or without coolant equipment. Standard equipment includes quick change gear box, power feed universal carriage, handlever cross slide, compound rest cross slide, and handlever bed turret. Standard extras (not included in prices of lathes) include 4-way turret tool block, tailstock, collet attachment, taper attachment, thread dial indicator, and micrometer carriage stop. Write for Bulletins 1002 and 1004 which contain complete information and specifications.

SOUTH BEND LATHE WORKS

Dept. 230 SOUTH BEND, INDIANA — *Lathe Builders for 35 Years*

Three hand cut burs . . . when we received them they were dull —the "bite" was gone. Kellerflex converts these worn burs into good-as-new ground burs. The same treatment can be administered to mill cut or ground burs.

Here are the three burs after Kellerflex reconditioning has restored their cutting qualities. New teeth have been ground . . . clean and sharp. They are ready for another useful life on the production line. And when they need it they can be resharpened time and time again.



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KELLERFLEX recut burs conserve vital metals . . . Cut Costs

Send us your worn burs and rotary files. Regardless of make, cut, style, shape or size, we will convert them into ground burs . . . cut new teeth and restore the original bite and cutting qualities. Burs reconditioned in this manner can be resharpened time and time again.

With this service one bur frequently does the work of six or more . . . conserving one of our most vital metals and at the same time making a tremendous cut in bur costs.

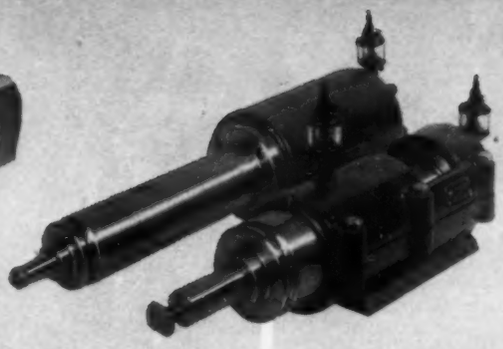
Write at once for detailed information

PRATT & WHITNEY

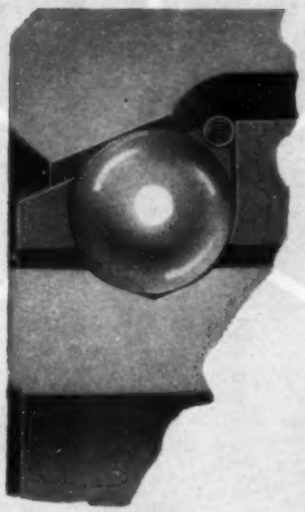
DIVISION NILES-BEMENT-POND CO. • WEST HARTFORD, CONN.

Kellerflex Sales Department

Precision Boring as universally used today was developed mainly through the availability of the Ex-Cell-O *Precision* spindle. Above is Style 1212-A, one of nine standard Ex-Cell-O Precision Boring Machines featuring the Ex-Cell-O *Precision* Spindle.



ABOVE: Ex-Cell-O motor-driven and belt-driven types of spindles. *BELOW:* Close-up view of Ex-Cell-O *Precision* Ball Bearing. Through the arrangement of point contact between the ball and the race, each ball is given a gentle spinning motion that results in every part of the surface of each ball being presented for wear. This minimizes bearing wear and aids in maintaining the spherical shape of each ball. Ex-Cell-O Precision Bearings on Ex-Cell-O Spindles are interchangeable as a unit.



Thread Grinding Machines, producing work to extremely close limits, must have *Precision* Spindles. Above is Style 35 Universal, one of eight styles of Precision Thread Grinders made by Ex-Cell-O, all equipped with Ex-Cell-O *Precision* Spindles.

TO LEFT: Ex-Cell-O Style 44 Carbide Tool Grinder, equipped with Ex-Cell-O inbuilt balanced motor spindle mounted in Ex-Cell-O *Precision* Ball Bearings.

TO RIGHT: Ex-Cell-O Center Lapping Machine, Style 74, for accurately conditioning female centers. This Ex-Cell-O machine also features the Ex-Cell-O *Precision* Ball Bearing Spindle.

PRECISION *begins with the* EX-CELL-O BEARING

The greater accuracy, increased production, and better finish that a large number of manufacturers are obtaining today on Ex-Cell-O machine tools equipped with the Ex-Cell-O Precision Spindle can, to a great extent, be attributed directly to the superior features of the Ex-Cell-O spindle ball bearing—a bearing specially designed by Ex-Cell-O and precision fitted by patented Ex-Cell-O methods. For instance, many thousands of Ex-Cell-O grinding spindles with these special bearings are in daily operation throughout American industry—satisfactorily meeting all the demands made upon them by today's strenuous production pace. This is why many manufacturers of grinders use the Ex-Cell-O Precision Spindle as part of their original equipment, and why numerous metal-working plants throughout the United States insist upon the Ex-Cell-O Precision Spindle whenever spindle replacements have to be made.

EX-CELL-O CORPORATION • DETROIT, MICH.

THREAD GRINDING, BORING AND LAPPING MACHINES • TOOL GRINDERS • HYDRAULIC POWER UNITS • GRINDING SPINDLES • BROACHES • CUTTING TOOLS • DRILL JIG BUSHINGS • DIESEL FUEL INJECTION EQUIPMENT • R. R. PINS AND BUSHINGS • PRECISION PARTS

XLO

EX-CELL-O *means* PRECISION

PREVIOUS EXPERIENCE NOT NECESSARY

GISHOLT SIMPLIMATIC LATHES require very little operator training. All functions of this machine are entirely automatic. The operator merely loads and removes the work.

Such simple, automatic operation makes it possible for one man (or woman) to tend two or more Simplimatics.

With multiple cutting and its swift cycle of operations, the Simplimatic produces continuously, accurately—at a brisk pace that no skilled machinist could ever equal.

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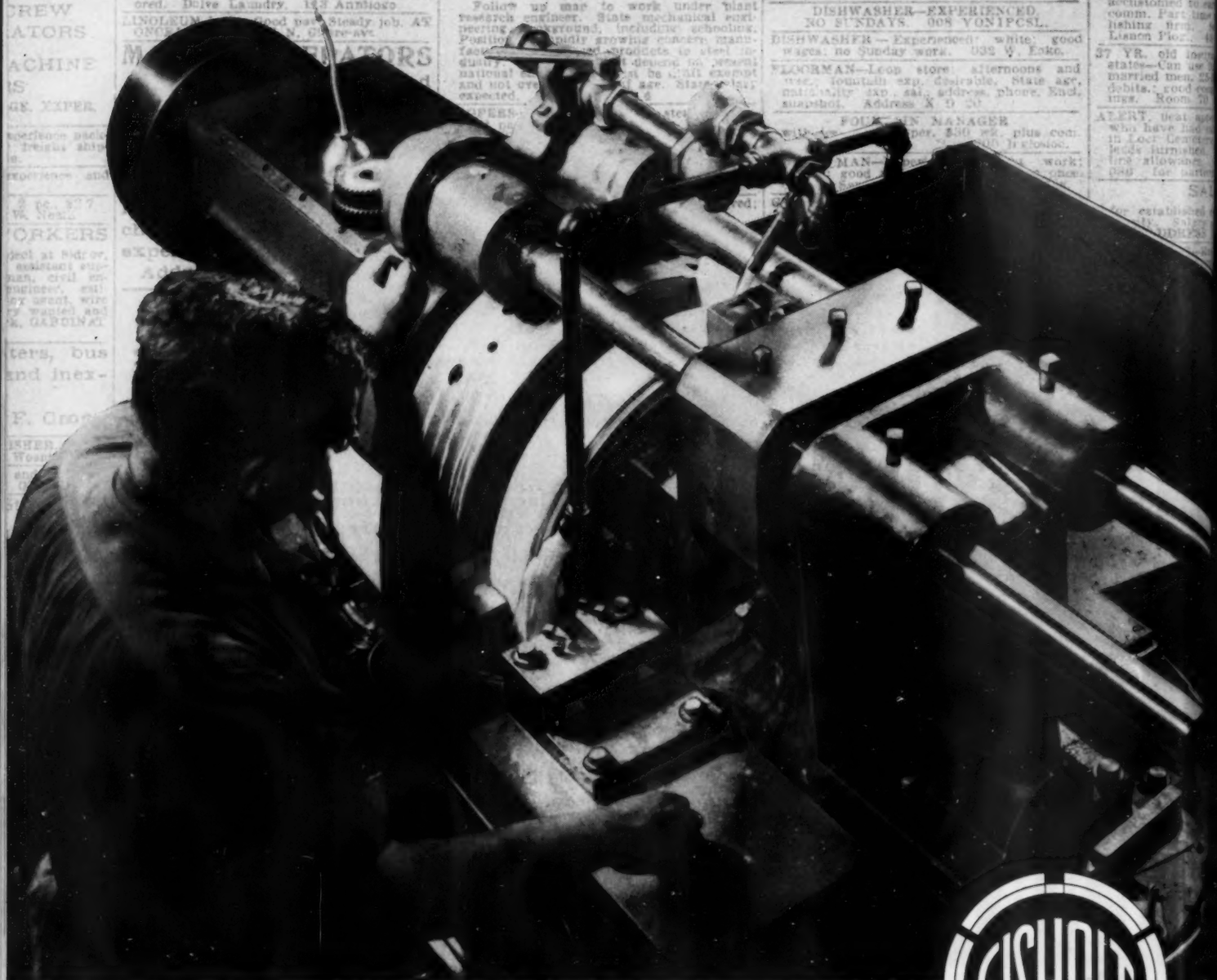

LOOK AHEAD . . . KEEP AHEAD . . . WITH GISHOLT IMPROVEMENTS IN METAL TURNING

TURRET LATHES • AUTOMATIC LATHES • BALANCING MACHINES

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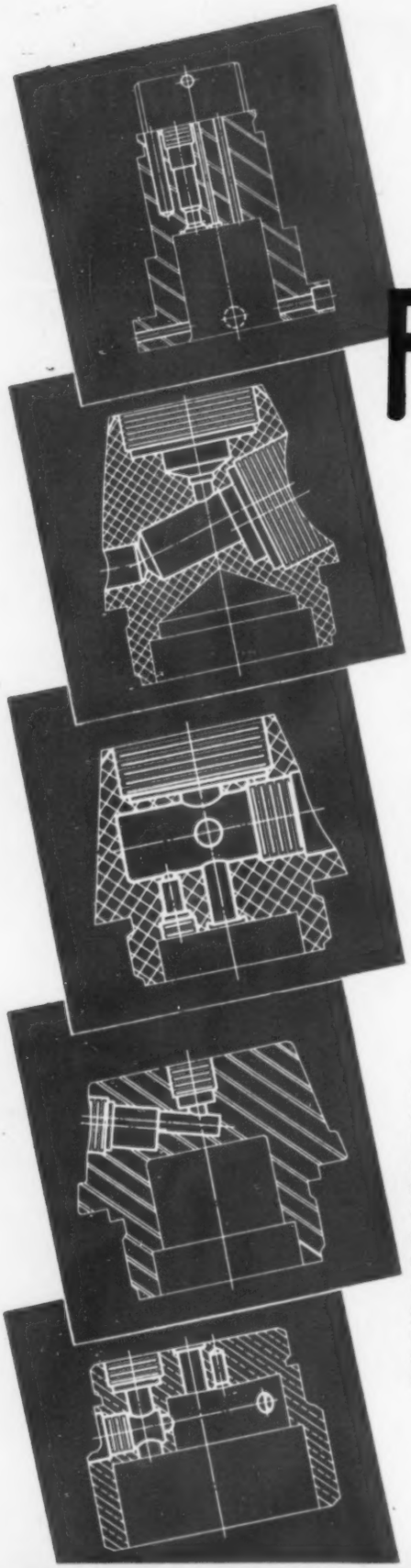
UNIVERSAL MILLING FIXTURE...

...converts any bench lathe into an efficient milling machine



Intricate Fuse Parts Produced with Minimum Number of Chuckings

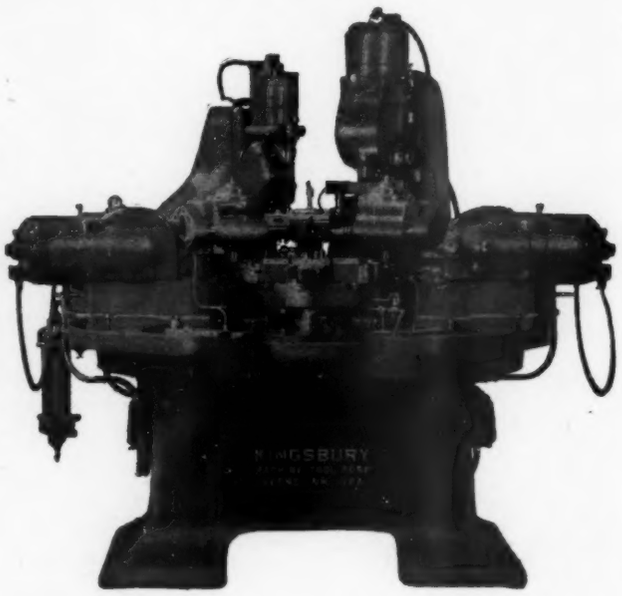
FLEXIMATIC

by KINGSBURY

The blanks for these shell fuse parts are taken from automatics and completed in from one to four handlings. Kingsbury FLEXIMATICS make it possible to perform in a single chucking a dozen or more highly intricate machining operations on fuse and rifle components and similar parts where speed and accuracy are essential to successful National Defense production.

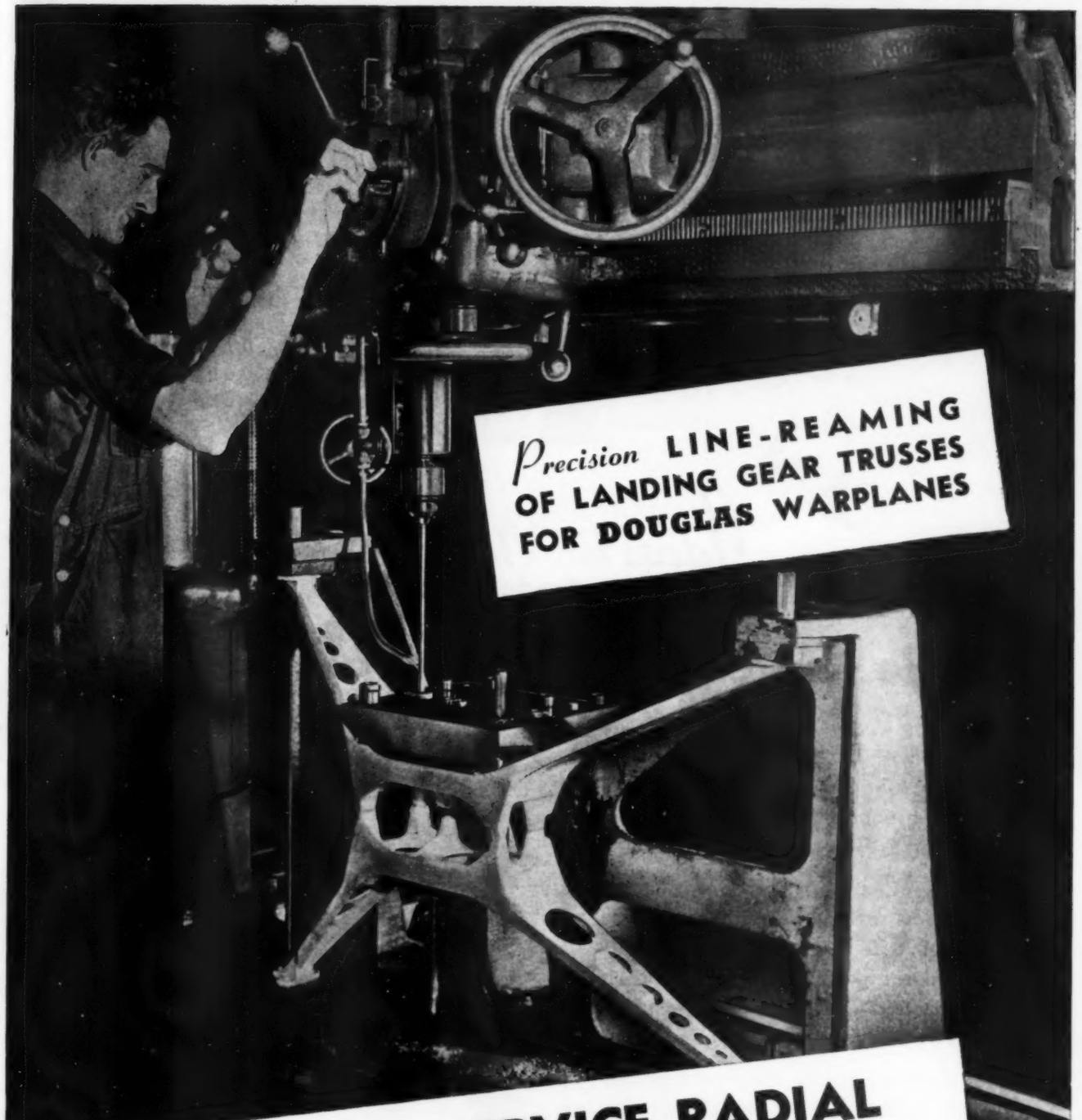
Munitions production presents a three-fold problem . . . high standards of accuracy, pressing production demands and scarcity of skilled labor. Kingsbury FLEXIMATICS provide—in a single machine—the efficient means to solve all three phases of your defense production problems.

The FLEXIMATIC system of construction consists of Standard Units for drilling, tapping, boring, reaming, spot-facing, etc. Mounted on one of several standard bases. This unique method provides a flexible set-up which can be changed over to meet the machining requirements of many different parts.



KINGSBURY MACHINE TOOL CORPORATION

KEENE NEW HAMPSHIRE U S A



Precision LINE-REAMING OF LANDING GEAR TRUSSES FOR DOUGLAS WARPLANES

THE SUPER SERVICE RADIAL

Here's a well-known Machine Tool, well-known for its rapid, low cost, high precision, quality work! The features of the Super Service Radial make this machine ideal for war-production plants where continued service for 24 hours a day, 7 days a week, is routine practice. The Super Service Radial is illustrated above, set up for line-reaming landing gear trusses, at one of the Douglas Aircraft plants. This job calls for extreme accuracy; two trusses are located in the jig by means of plugs inserted through reamed holes to maintain in-line accuracy of both parts. Consistently accurate performances of this nature are characteristic of the Super Service Radial. List of features will be sent upon request.

SUPER C B SERVICE

THE CINCINNATI BICKFORD TOOL CO. OAKLEY, CINCINNATI, OHIO, U. S. A.

A Citation for Men in War Industry

Ideas for VICTORY

—from the Production Lines behind the Firing Lines

He Conserves Tool Steel and Saves Time Resetting Cutters

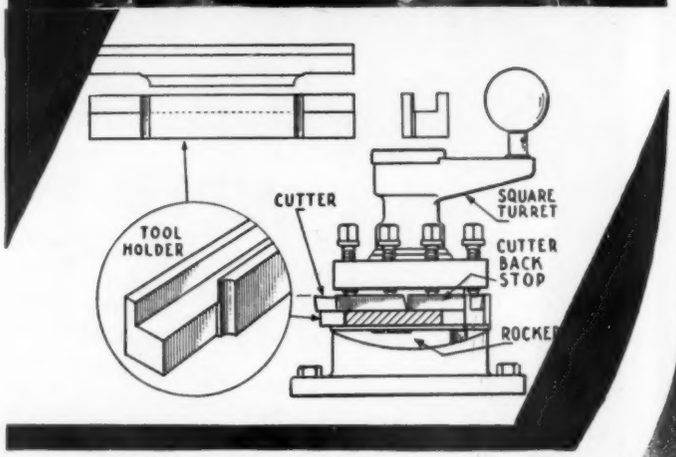
Harry Johnson, a machine tool instructor at Cramp Shipbuilding Co., Philadelphia, has been awarded a Victory Pin for this idea:

A channel, milled from a piece of square stock, is used to support smaller cutter bits in square turrets where larger size forged cutters are ordinarily used. Held in place by two of the square turret bolts, cutter bits are located against a square piece of cold rolled steel held by the third square turret bolt.

Whenever a cutter must be removed for touching up, it can easily be relocated in the channel against the square stock, the square turret bolts tightened, and the cross slide advanced a few thousandths with the micrometer dial, depending on how much was removed from the nose of the cutter during regrinding. By this method tool bits are useful down to very short lengths and time is saved in resetting cutters.

Hundreds of resourceful operators, anxious to help others, send in many practical "Ideas for Victory" to be published in "Blue Chips",

Instructor Johnson Watches Results



a newsy shop bulletin sent free by Warner & Swasey. Make sure your operators are on our list to receive it at their homes. Write Warner & Swasey, Cleveland, Ohio.

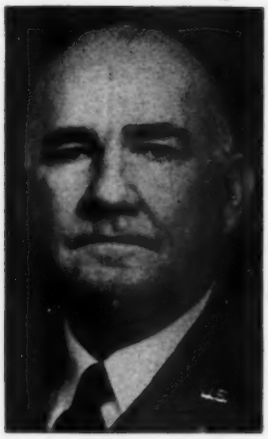
WARNER & SWASEY FOR VICTORY

YOU CAN TURN IT BETTER, FASTER, FOR LESS . . . WITH A WARNER & SWASEY

WHAT'S IN THIS ISSUE

DIES IN A HURRY

Aircraft tooling is made with one eye on speedy production and the other on design improvement. Since sheet-metal parts predominate in airframe construction, punches and dies must be designed to give needed quality and quantity without delays in tool-making. The die-making principles described in this issue filled these conditions so successfully that they have been adopted by a number of leading aircraft manufacturers. Page 815.



MAJ.-GEN. CHARLES T. HARRIS, JR.

GUN-MAKING METHODS

Development work, carried on by the Ordnance Department during a period when little thought was given gun-making elsewhere, is now bearing fruit. Major-General Charles T. Harris, Jr., commanding officer of the Aberdeen Proving Grounds, tells of some of the new techniques. Among them are centrifugally cast gun barrels and the use of auto-frettaging to increase their strength. Page 822.

FUZE TOOLING

A Canadian contractor for 40-mm. fuzes discovered that the use of two-spindle drill heads would materially help to speed deliveries. Since the heads were special he designed and built them himself. They meet the close center distance called for on this product. Page 832.

SHELL PLANNING

A prominent automotive parts manufacturer, when awarded an order for 37-mm. shell, turned naturally enough to multiple-spindle automatics for the primary operations. This company's tool engineers were smart enough to know that the second operations can be the more time-consuming. The methods used to simplify secondary set-ups make a timely story. Page 837.

MOLDING FOR WAR

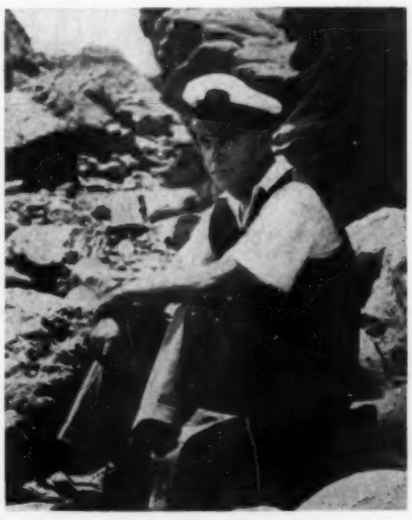
The Ford Motor Company has been "sold" on plastics for a long time. Out of its own plastic shops have come the materials for many of its automobile accessories. Today, with car production suspended, these same shops are supplying the Ford war industries, saving scarce metals. An article by Herbert Chase describes the Ford set-up for injection molding. Page 829.

TAP DRILL SIZES

To bring our readers up to date on this subject, our reference book sheets in this number begin a standard recently adopted by the National Bureau of Standards. Tap drills are designated for each standard thread size, both National Coarse and National Fine. Pages 849 and 851.

SAFE SHOP

Safety is more than the use of gear guards and other mechanical means of accident prevention. It is a state of mind, and any organization that has it should have a fine safety record. Alfred M. Cooper describes its basic requirements, particularly as they affect the thousands of workers who are new to industry. Page 819.



ALFRED M. COOPER

BERNARD DARCY

HOME-MADE TURRETS

Bernard Darcy, ordnance engineer, New York Ordnance District, has a good story about a shop that wanted to do war work but was not equipped for it. With a little ingenuity and some cooperation from the Ordnance Department, the company's engine lathes were converted to turret lathes. (P. S. They got the order). Page 826.

LEAF JIGS

John G. Jergens, Cleveland Pneumatic Tool Company, contributes another set of sketches on jigs and fixture details. This collection of handy tool suggestions are concerned chiefly with leaf jigs. Some indexing mechanisms are shown also. Page 824.

COMING

A few months ago we completed a series of articles on oxyacetylene flame-hardening. The interest in this process was reflected in numerous inquiries for reprints. In the near future these pages will carry another serial, describing a new development—the application of city gas to flame-hardening. The material is beign prepared by R. F. Apter and H. W. Smith, Jr., of the Selas Company.

AMERICAN MACHINIST's blue paper sections on the working of materials owe their recognition in the industry to the fact that they are crammed with practical shop data without surplus words or window dressing. The next material section is now in preparation and will make its appearance soon. It will deal with the working of high nickel alloys.

There's Accuracy Where Cincinnati Shapers Work

Always the handy shaping tool—in its present highly developed form the shaper has taken on a new importance. For many planing jobs, for tool room and die work the Shaper is indispensable. Cincinnati accuracy has been considered a standard for more than 40 years.

16" to 36" Stroke
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ESTABLISHED 1877 **AMERICAN MACHINIST** BURNHAM FINNEY, Editor

Punches Cut Their Own Dies

BY JOHN HAYDOCK, MANAGING EDITOR, AMERICAN MACHINIST

Aircraft press tools are made by a process that combines low cost with quantity production

NECESSITY has stimulated the development of novel tooling methods in the aircraft industry. Some of the most ingenious devices for reducing the time interval between design and production are found in the fabrication of sheet metal. Traditional die-making practice has been cast aside in order to speed up the job of equipping the air forces of the United Nations.

Many of the innovations in metal-forming employed by the industry have been reported in these pages. Among these are the cast Kirksite forming dies (*AM*—Vol. 86, page 15) which have effectively cut time and cost in shaping aluminum alloy sheet.

Recently a new type of blanking and piercing die has come into vogue in the plants of a number of California aircraft manufacturers. An outstanding feature of these dies is that once the male half, or punch, is formed, it cuts its own female die. Another noteworthy development is the use of flame hardening when the dies are employed for blanking sheet steel.

The dies are characterized by their simple construction, low initial cost, short set-up time, high quantity production, small storage space and low repair cost. They are adaptable to both dural and steel parts. At present they are employed by the Lockheed Aircraft Corporation, the Consolidated Aircraft Corporation, the Douglas Aircraft

In this method of diemaking, the finished punch is mounted in the press with the roughed out die. The shearing action of the punch completes the die contour

A fine ribbon of metal is shaved from the die by the punch. In working on dural sheet the die is made of Kirksite A

Company and many other manufacturers. Because of short set-up time and high production rate, these dies are applicable to either short or long runs.

Each set consists of a backing plate to which the punch is attached with flush rivets and a second backing plate to which the die is riveted. Around the punch and inside of the die, pieces of rubber act to strip the trimmings and blanked parts from the punch and die. In each of the two backing plates, two holes are jig drilled and reamed to a slip fit on hardened dowel pins permanently located in the upper and lower halves of the die set. By keeping the die set permanently installed on the punch press, all that is necessary, in changing a die, is to slip the backing plates with their attached parts off these dowel pins and install others.

A standard precision die set is used. To the upper half of the set, a piece of aluminum is attached, and in it grooves are cut into which permanent magnets are placed. These magnets hold the punch or die in place whichever is up-

STEPS IN MAKING SIMPLIFIED DIES FOR

FIG. 1 Punch-Plow Steel Plate

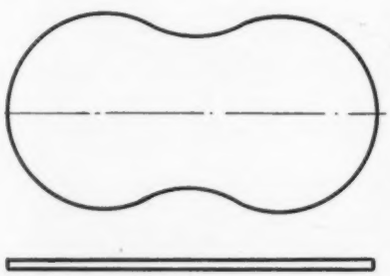
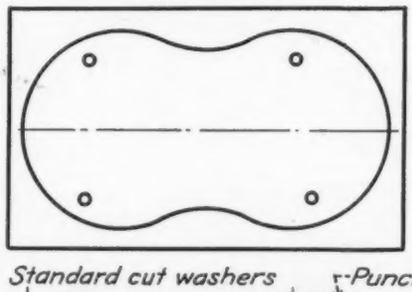


FIG. 2 Punch



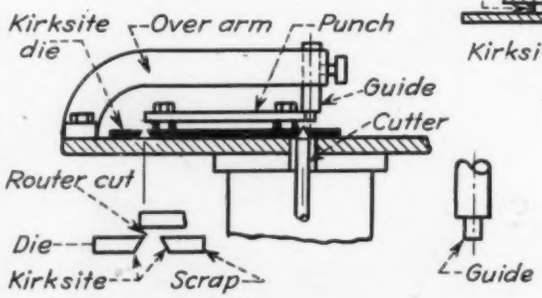
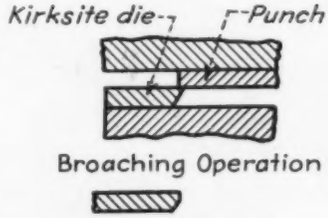


FIG. 3 Router



Kirksite Die After Broaching

FIG. 7

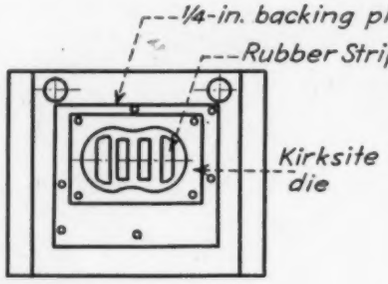


FIG. 4 Die Plan

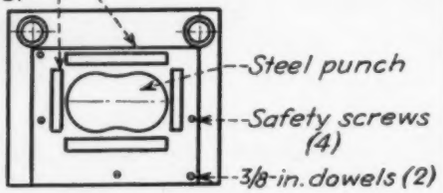


FIG. 5 Punch Plan

1. Layout blanking punch (Fig. 1) using a master part as a templet; or layout to a blueprint of the part.

2. Saw and file the punch to the layout. *Alternate method:* Route the punch on a Keller machine using a master part or a templet.

3. Cut backing plates to size. Drill and ream two ⅜-in. dowel pin holes; drill and countersink four safety screw holes using a drill jig.

4. Clamp the punch, Kirksite plate and backing plates together and drill rivet holes.

5. Clamp the punch to the Kirksite plate. Drill four ¼-in. holes for clamping the punch to the Kirksite. Clamp the punch and Kirksite together (Fig. 2).

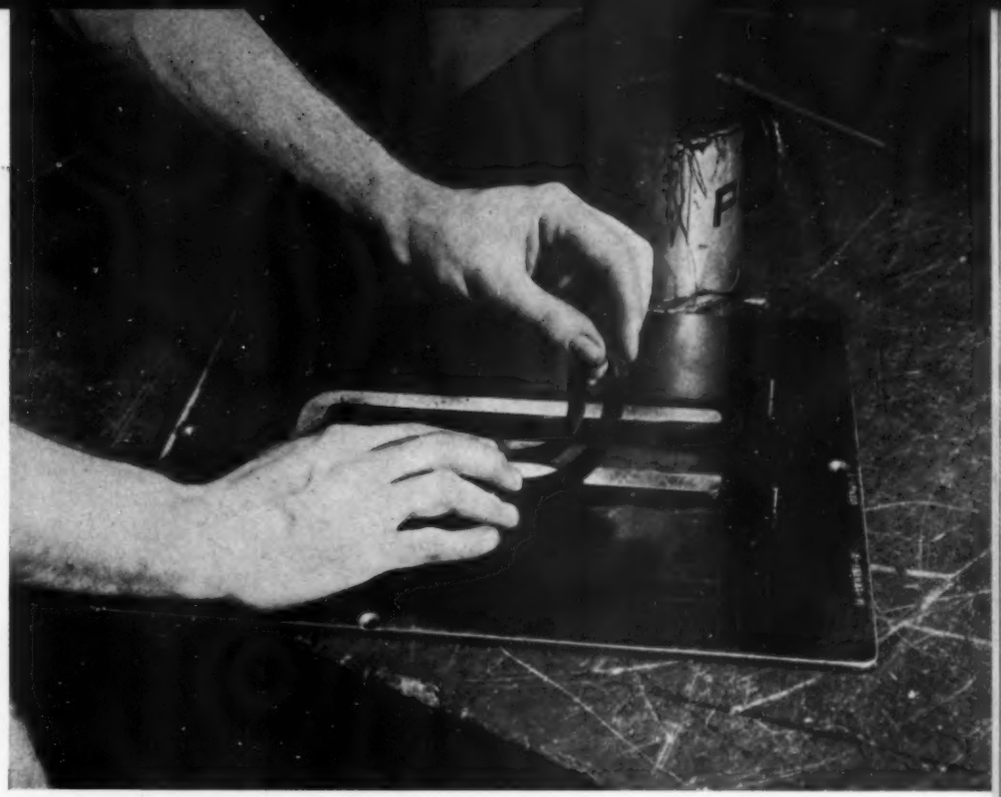
6. Route the Kirksite plate, using the punch as a route block (Fig. 3). *Alternate method:* Instead of operations 4, 5 and 12, clamp the punch to the Kirksite plate and scribe the punch outline on the plate; or force the punch into the Kirksite die stock sufficiently to produce a line to file to. Saw and file the Kirksite plate.

permost. The female half of the die is frequently on top when the set is used for perforating. No other means of clamping the die is needed.

Four holes are drilled and tapped in the two halves of the die set and register with countersunk holes in the backing plate. Flat-head screws in the tapped holes act as safeties in case trouble is experienced in stripping.

While the underlying principle is the same, details of construction differ when aluminum and steel are used. For dural and alclad blanking, punches are made of $\frac{1}{4}$-in. 0.50 to 0.60 carbon plow steel. Dies are made of rolled Kirksite A, $\frac{1}{4}$ in. thick, for thicknesses of stock ranging up to 0.064 in. Kirksite blanking dies are particularly applicable to aluminum alloy parts in quantities too large for routing or sawing and too small for the use of steel dies. One company reports as high as 5,000 dural blanks $\frac{1}{16}$ in. thick, cut a with single Kirksite A die. For greater thicknesses, soft steel dies are used.

For blanking stainless steel or SAE



Rubber strippers are inexpensive and quickly installed. They are usually applied to both the punch and the die

DURAL OR ALCLAD PARTS AT LOCKHEED

7. Assemble plates and punch using the four rivet holes drilled in the punch and backing plate in operation 4 (Figs. 4 and 5).

8. Drill and ream pierce punch holes.

9. Provide slug clearance slots — either shaped slots or spaced backing plates riveted to the main backing plate.

10. Assemble and rivet the Kirksite die to the backing plate. Rivets should have a maximum spacing of two inches (Figs. 4 and 6).

11. Locate stock guides and stops (Fig. 6).

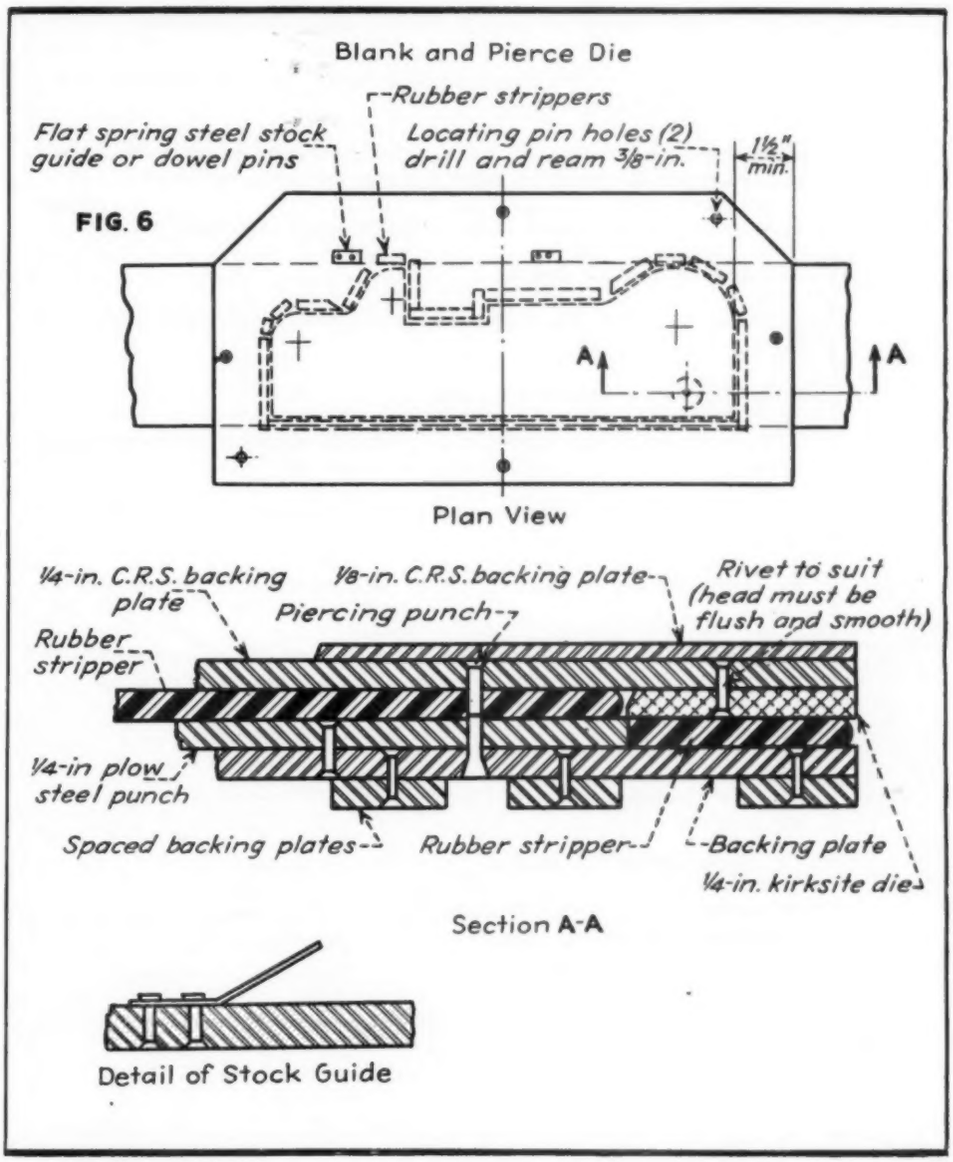
12. Shear the punch into the Kirksite plate (Fig. 7).

13. Install and grind the piercing punches.

14. Cement rubber strippers to the punch and die backing plates (Figs. 4, 5 and 6).

15. Try out.

FIG. 6

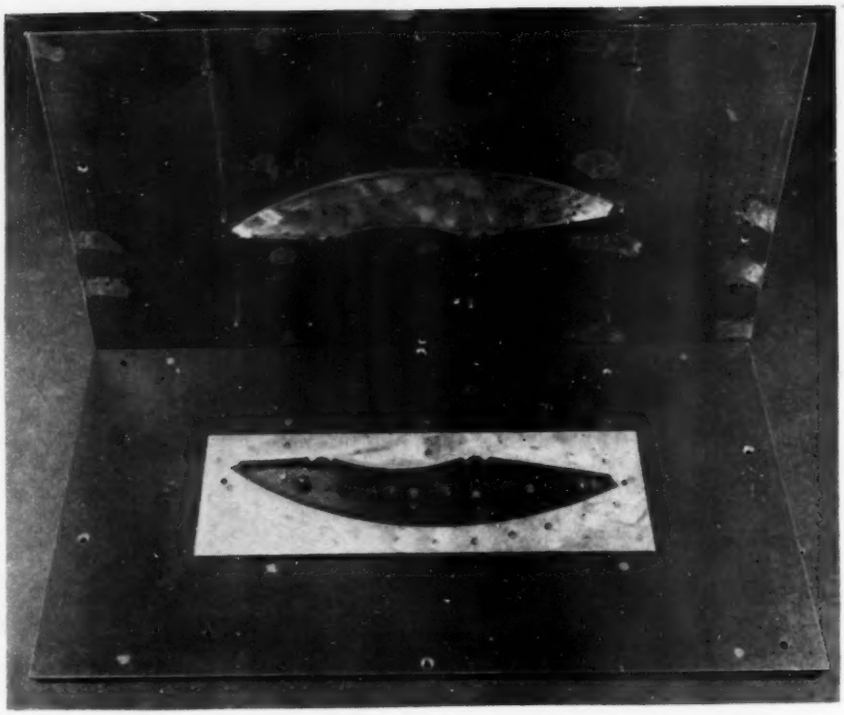


4130 steel, punches are made of a steel which can be flame hardened. The steel punch should be from $\frac{1}{4}$ to $\frac{1}{2}$ in. in thickness.

Dies for use with stainless and SAE 4130 steels are made of carbon steel or alloy die steel, having air-hardening or water-hardening characteristics. These steels can be flame hardened to produce a hard cutting edge. Use of this method keeps distortion to a minimum. The dies can be peened to correct clearance errors which is a big advantage. From $\frac{1}{4}$- to $\frac{1}{2}$-in. thicknesses are used.

When air-hardening steel is used a non-deforming type is advisable; no quench is needed. However, the practice at Lockheed is to place the die in a tank of water nearly covering it, leaving only $\frac{1}{32}$ in. of the cutting edge exposed. The water performs the dual service of quenching and keeping the body of the punch cool during flame hardening, thus minimizing distortion.

Backing plates are made of $\frac{1}{4}$-in. cold-rolled or $\frac{1}{4}$-in. hot-rolled 1020 steel.



A typical die set shows male and female sections before mounting in a press. The rubber stripper has yet to be applied to the punch

STEPS IN MAKING SIMPLIFIED DIES FOR SAE 4130 AND STAINLESS STEEL PARTS AT LOCKHEED

1. Layout the blanking punch using a master part or templet; or lay out to blueprint of the part.
2. Saw and file the punch to layout. *Alternate method:* Route the punch on a Keller machine, using the master part or a templet.
3. Provide piercing punch holes in the punch if required.
4. Flame harden the punch.
5. Stack the punch, die stock and backing plates; then drill through all for the dowel pin holes.
6. Scribe the die around the punch.
7. Saw out the die at approximately 15 deg. allowing for shearing and filing.
8. Attach the punch permanently to the backing plate and grind the face.
9. Attach the die temporarily to the backing plate and shear with the punch.
10. Remove the die from the backing plate and file clearance.
11. Flame harden the die.
12. Assemble the die; rivet and grind.
13. Install piercing punches, if required, by drilling and reaming through the punch as a jig.
14. Install rubber for stripping.
15. In the case of narrow cut-outs, use ½-in. die material and make a steel stripper plate placed over rubber to strip the parts.
16. Try out.

These plates are cut to size, and the holes drilled and reamed in a jig for the particular size of die. Plates to back up piercing punches are made of $\frac{1}{8}$-in. cold-rolled steel.

Pure gum rubber or Neoprene of approximately 60-deg. durometer hardness are used for stripping. For parts having narrow cut-outs, where difficulty would be experienced in stripping with rubber, the die is made $\frac{1}{2}$ in. in thickness, allowing for a thin steel stripper plate covering the rubber to be used in stripping the part from the die.

Piercing punches are made of drill rod, where possible, hardened and ground on the ends, then inserted in the proper position in the backing plate.

Stock guides are made of $\frac{1}{8}$- or $\frac{1}{4}$-in. hardened dowel pin stock or flat spring stock. Stock stops are $\frac{1}{8}$- or $\frac{1}{4}$-in. dowel pin stock.

The backing plates and punches or dies are flush riveted together with $\frac{1}{4}$-in. soft iron rivets. Usually four rivets are sufficient except for Kirksite dies when the rivets should be spaced not more than 2 in. apart around the die opening.

Steps in making these dies for use with both aluminum and steel are detailed in the accompanying tables. Big savings in time of tool preparation result from their use.

Strategy for Safety

BY ALFRED M. COOPER

A good safety program includes not only the use of guards, but basic training to remove the underlying causes of accident

EVER SINCE the beginning of our augmented war production program we have been short of skilled labor. Despite the partly effectual efforts of various industrial and governmental agencies to substitute quickly trained men and boys for experienced journeyman mechanics, there is yet no adequate supply of highly skilled workmen in any of our war industries.

The work of imparting a few minor skills to young men and boys is carried on in NYA shop schools, in some public trade schools, in schools operated by unions and within industry itself. In many instances these schools are improperly equipped. The instructors are often men who have been trained as manual training teachers in our universities, but who have themselves had little or no actual experience as workers in industry. They have a fair understanding of the mechanical operations they are to teach to the green hands placed in their charge, but little conception of the hazards that exist in the performance of these operations, once the learner has gone to work in a war plant.

In other instances, the instructors are experienced mechanics loaned by local industry to NYA and other trade schools. These mechanics, whose expert services are today sorely needed in their own factories, have generally not been trained in methods of teaching safety at the same time they teach the mechanical operations of a trade.

The need is for adequate training of both types of shop instructors, so that they may learn to teach safety right along with mechanical skill. Then the novice will enter industry with some sense of how to conduct himself in hazardous surroundings.

A second factor responsible for our unreasonable toll of death and injury in industry is concerned with accident prevention work within the war plants themselves.

As old plants expanded and new plants sprang up in the cornfields, hundreds of young safety engineers were put to work. From one end of the plant to the other these men rushed, putting fancy guards on flywheels, emery wheels and punch presses, all of which protection devices were designed to take the human element out of accidents. If gadgets could have licked the fatality record, accidents would have ceased happening in these plants two years ago.

But accidents have not ceased.

After every conceivable safeguard has been bolted on to a piece of machinery there yet remains the human factor to be considered in accident prevention. The individual worker must be *trained* to work safely or there will continue to be accidents, no matter how many guards have been installed.

To teach the employee to work safely, safety training classes have been instituted. Sardonically enough, much of this training, supposedly designed to *eliminate* accidents, takes the form of first-aid training. First-aid training is of value, but has no resemblance to, nor should it be confused with, safety training.

In attempting to teach the employee to work safely many methods of instruction have been tried. In some plants workmen were periodically herded into lecture halls and exhorted by the safety experts. In others they have been exposed to programs of ridicule, with the idea of shaming them out of their unsafe habits. Sometimes "horror" posters, depicting the gruesome results of accidents, have been widely displayed.

A method of safety training that demonstrably can cut accident rates in the most hazardous occupations was applied by a pioneer in industrial education, Charles R. Allen, in his initial foremanship training conferences.

In the conference method of safety training there is no exhortation, no lecture, no "hooraw," no ridicule, no atetempt to frighten by the display of horror pictures. Inherent in this method are the assumptions, first, that no employee wants to have accidents, and second, that any experienced group of industrial workers know more *as a group* about accident prevention in their department than they can be taught by a safety expert. It is perhaps the necessity for tacit acceptance of this latter assumption that has prevented a wider application of this method of safety training.

Allen found that factory foremen dislike to be lectured to, but at the same time enjoy conferring together over their supervisory problems. By pooling the brain power of twenty or thirty foremen, he was able to raise the level of supervisory efficiency in any industrial plant in which this training was applied.

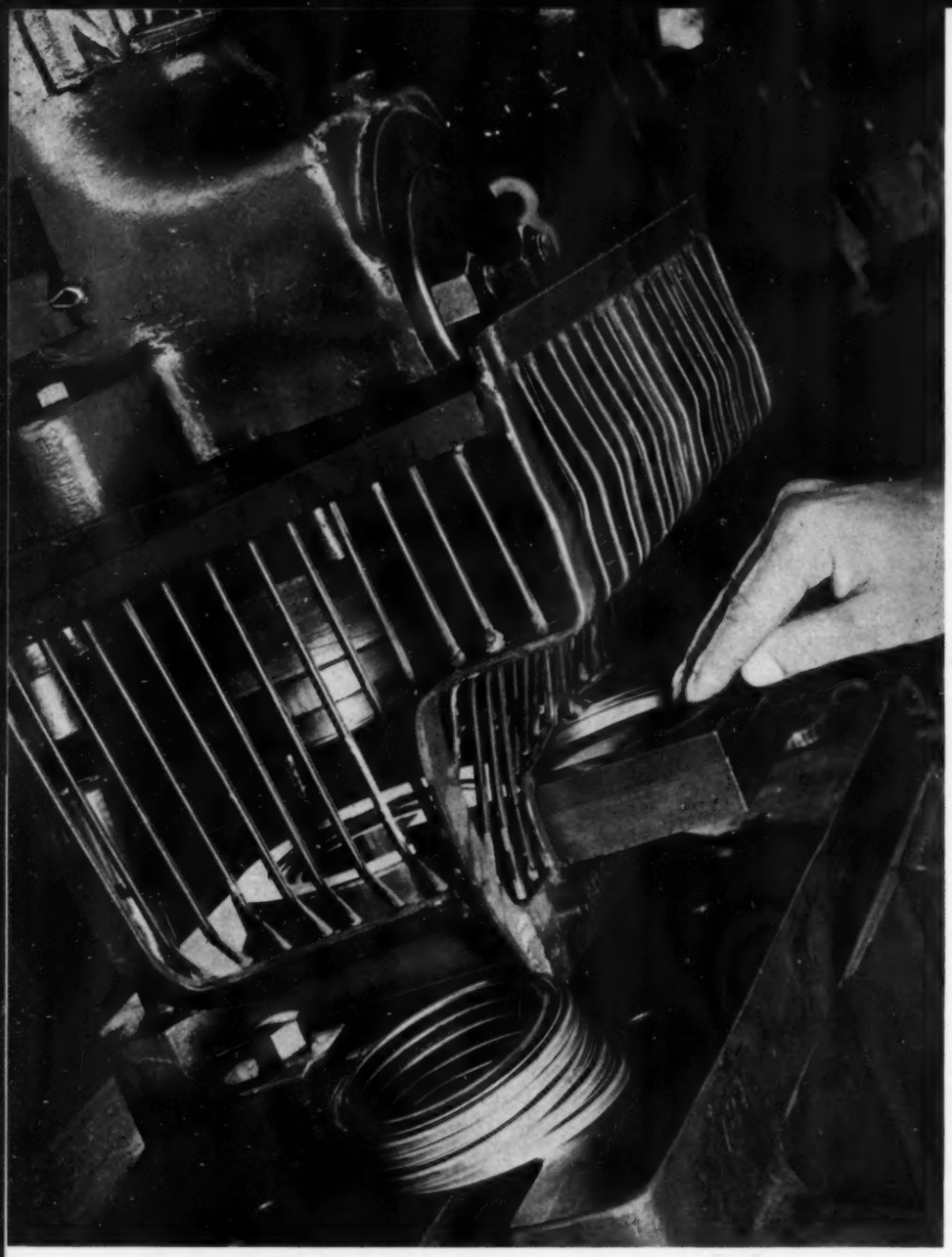
Those who have followed in his footsteps have succeeded in adapting this idea to other forms of industrial training. In each instance there is never any attempt to lecture the students or to tell them how to run their jobs. The effort is to develop ideas from the various group members and make these ideas available to the group as a whole.

The conference method of safety training has taken two forms, either of which is effective. In one instance an experienced conference leader leads safety discussions with the workmen. In the other, and perhaps better, method the employees' foreman or supervisor himself leads the safety discussions. In one latter case the educational director must function as a teacher-trainer, developing the foremen as effective conference leaders.

In all safety instruction there is but one proper approach to the subject. All discussion should be confined to methods of obviating those *underlying causes of accidents* which exist wherever accidents occur. Instead of talking about how to induce workers to wear

TO CONSERVE MANPOWER

In terms of production, industry last year lost 460,000,000 man-days of work because of accidents. A nation-wide safety movement to control this mounting drain on the war effort is being launched in the United States by a group of leading business men and industrialists. The War Production Fund to Conserve Manpower, as it is called, is headed by W. A. Irvin, former president of the U. S. Steel Corporation. The toll taken by off-the-job accidents is even higher than that taken by accidents in the factory, so that the drive will be for greater safety in industry and in the home.



Special guards such as this are now installed on many machines to reduce the possibility of accidents caused by carelessness

goggles the discussion concerns itself with methods of eliminating the negligence that lie behind the workman's failure to wear his goggles.

In the first of a series of safety conferences the leader develops from the group the underlying causes of accidents in their department. He does this simply by asking the employees the question, "What are the underlying causes of accidents in our department?" and listing the score or more of replies on the blackboard. At first the group may be at a loss as to just what constitutes an underlying cause of accidents, but they very soon get the idea. From then on their thoughtful response is amazing to one who has never led training conferences.

When a sizeable list of such causes has been developed the leader asks the employees to arrange these in their order of importance as causes of accidents in that department. A hot discussion ensues, in which the amount of thought on this subject of accident prevention displayed by an average group of workmen is surprising.

After a "round" of similar meetings have been held throughout a particular department, either by the training supervisors or by the foremen of that department, the various lists of underlying causes are "boiled down" by the educational director, and each cause is assigned a weight, depending on the number of times it appears in first, second, or third place, in the various group lists. The resulting master list may look something like Table I.

This is your course outline for a safety training program which may continue in effect for a period of years. Allowing two or more meetings for discussion of each of the first half-dozen causes listed—since these may well be assumed to be responsible for most of the accidents occurring in the department in question—and holding the safety meetings once monthly, there are sufficient subjects here to form the basis for well over two years' study.

In the individual safety conferences, discussion is carried on in terms of discussion questions developed by the training supervisors, which questions are all based on case problems embracing the particular underlying cause that forms the subject for discussion at that

The danger of workmen getting their fingers jammed in this press is reduced by the use of special forceps to remove the stamping. However, an arrangement of this kind does not remove the need for training the operator in safety

TABLE I

	Underlying Cause	*Weight*
1.	Negligence	339
2.	Speed	265
3.	Over confidence	217
4.	Lack of knowledge	214
5.	Worry	208
6.	Thinking of things foreign to the job	192
7.	Improper supervision	168
8.	Physical defects of men	160
9.	Fear	150
10.	Defective equipment	144
11.	Lack of cooperation	142
12.	Wrong mental attitude toward safety	140
13.	Horseplay	106
14.	Misunderstanding of orders	91
15.	Disobedience of orders	61
16.	Lack of emotional control	56
17.	Poor judgment	51
18.	Bullheadedness	42
19.	Lack of interest	36
20.	Recklessness	25
21.	Outside interference	15

meeting. Any good training supervisor can devise adequate questions for discussion.

While staff instructors assigned to the plant training division can conduct satisfactory safety conferences, it is much better if these meetings are conducted by the direct supervisors of the workmen. This is the man to whom the workman naturally looks for instruction on the job. And the foreman is the only man who is in a position to see to it that all new ideas for safe working practices developed in training conferences actually are put into effect on the job.

Foremen may readily be trained as conference leaders. The best method of accomplishing this is by the use of rehearsed conferences. In this method, all foremen of a department meet with the training supervisor in a "rehearsal" meeting. In the course of this meeting the exact conference these supervisors are to lead with their subordinates in the month to follow is led by this training supervisor. The foremen here act as a discussion group, and at the same time observe closely the technique of the training supervisor in leading the safety discussion.

At the close of each rehearsal meeting the foremen are furnished with detailed conference plans, which instructions will guide them in the conduct of the safety meetings they will lead with their own subordinates. The foreman devotes about 3½ hours monthly to this effort, and the individual employee spends 1½ hours monthly in a safety meeting.

Meetings once monthly are all that are required in this type of training program. This is true because of the carryover that is generated in a properly conducted safety conference. Impromptu safety discussions often continue among the employees whenever they meet, through the month following a safety meeting.

As to results that may be obtained when the rehearsed-conference method of safety training is employed, the following may be considered indicative: When this method of training was installed in a plant in which the usual safety precautions were in effect, and in which old-style "departmental safety meetings" had been going on for many years, the accident frequency rate in the first year decreased 62 percent, and the severity rate decreased 88 percent. Fatalities ceased altogether.

In that department of the company in which was to be found the most hazardous occupations, the yearly average cost of accidents, for the past decade, had been more than $10,000. In the first six months of this training the cost fell off to $2,200, and in the second six-month period it dropped further to $198.

New, semi-skilled workmen in our defense industries must be better trained in safe working practice while they are still in training schools. When these novices go to work in a plant they should enter safety training conference groups, and these conferences should preferably be led by their own supervisors. Every employee doing hazardous work should attend safety conferences once monthly.

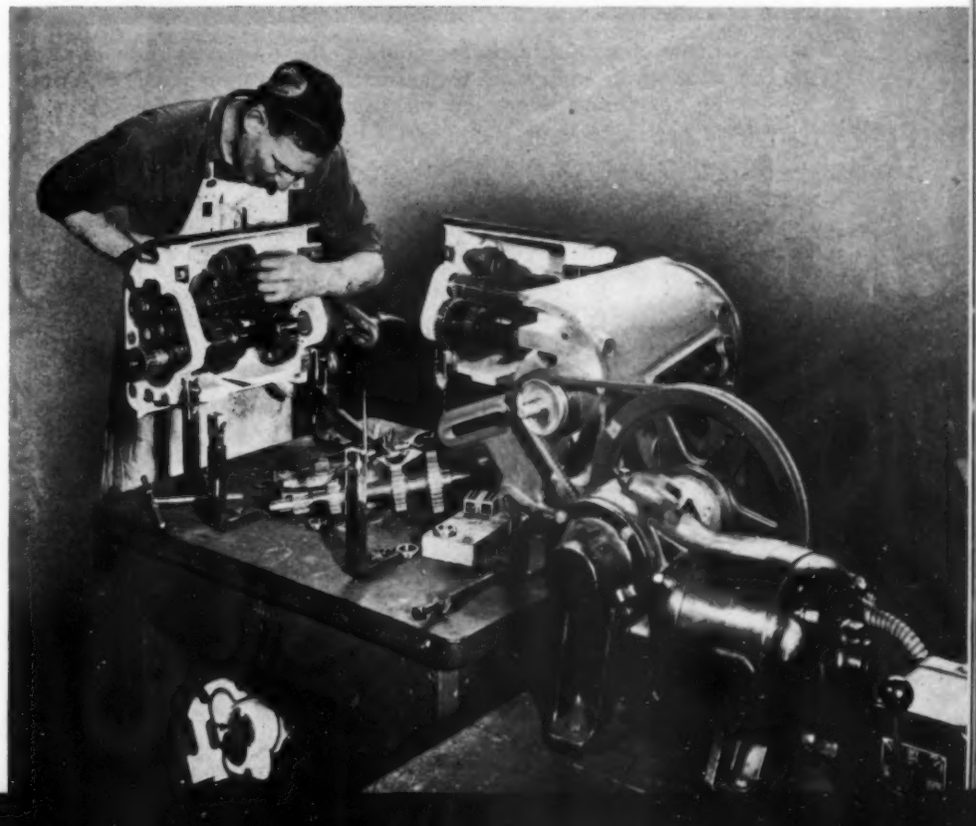
Smooth Running Gear Boxes

TO INSURE smooth operation of the quick-change gear boxes on its line of engine lathes, the Axelson Machinery Company runs each one in after subassembly and before final assembly to the machine. A floor stand with special brackets has been constructed for holding four of the boxes, one on each side of a square. The driving unit is portable and consists of a ½-hp. geared motor having a pulley belt connected to a temporary pulley in the gear box.

Each box is driven in turn for one hour, which is sufficient to run it in and to provide a no-load test. The tumbler gear is shifted from one position to the next driving the run.

The tumbler gear shift lever is not finally located until after the running-in period is completed; at that time a drill bushing is put in the hole in the lever that will later hold the spring detent. A copper shim is rolled between the tumbler gear and its mating gear in each position while the detent hole is drilled. This procedure gives a constant amount of backlash at every tumbler gear position.

Gear boxes are run in on this stand by means of a portable drive unit that can be located for any one of four stations. The operator is setting the tumbler gear blacklash

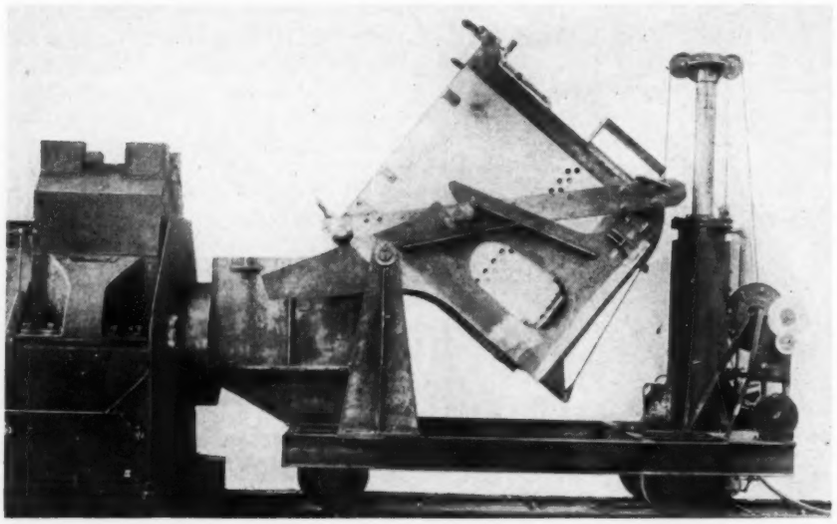


Guns Cast Centrifugally

BY BRIG. GEN. C. T. HARRIS, JR., ORDNANCE DEPARTMENT, U. S. ARMY

BECAUSE OF the unremitting toil of the Ordnance Department of the U. S. Army, our country today leads the world in the science of gun making. Outstanding developments in this field have been effected at one of the six research and manufacturing arsenals that compose part of this far-flung organization.

Achievements at this arsenal since the World War have effected a fundamental change in gun manufacture—the greatest since the invention of rifling and the breechblock. These developments include a centrifugal casting process of making guns; a cold-working (autofrettage) method of strengthening guns; and the development of better raw materials—stronger and tougher steel alloys.



When a furnace charge is ready for pouring, the furnace is transferred by crane to a pouring car and moved to the centrifugal casting machine. A pouring box directs the molten metal into the rotating mold

Until recently all cannon were of the built-up type; that is tube, jackets and hoops were shrunk one on the other to obtain the strength necessary for firing. This is a complicated process entailing the forging of these parts, machining them to close tolerances and then reheating and shrinking the jacket and hoops onto the tube.

Anti-aircraft guns and others from approximately one inch up to and including six inches can now be cast centrifugally to produce a single tube known as the monobloc gun. By casting, savings in time, labor and material of from 25 to 40 percent are effected over the built-up method. A single casting machine will turn out several gun tubes in the time it takes to forge one, and the equipment employed is far less costly. Much less machinery is necessary. The monobloc tube is also much lighter, yet it is as strong.

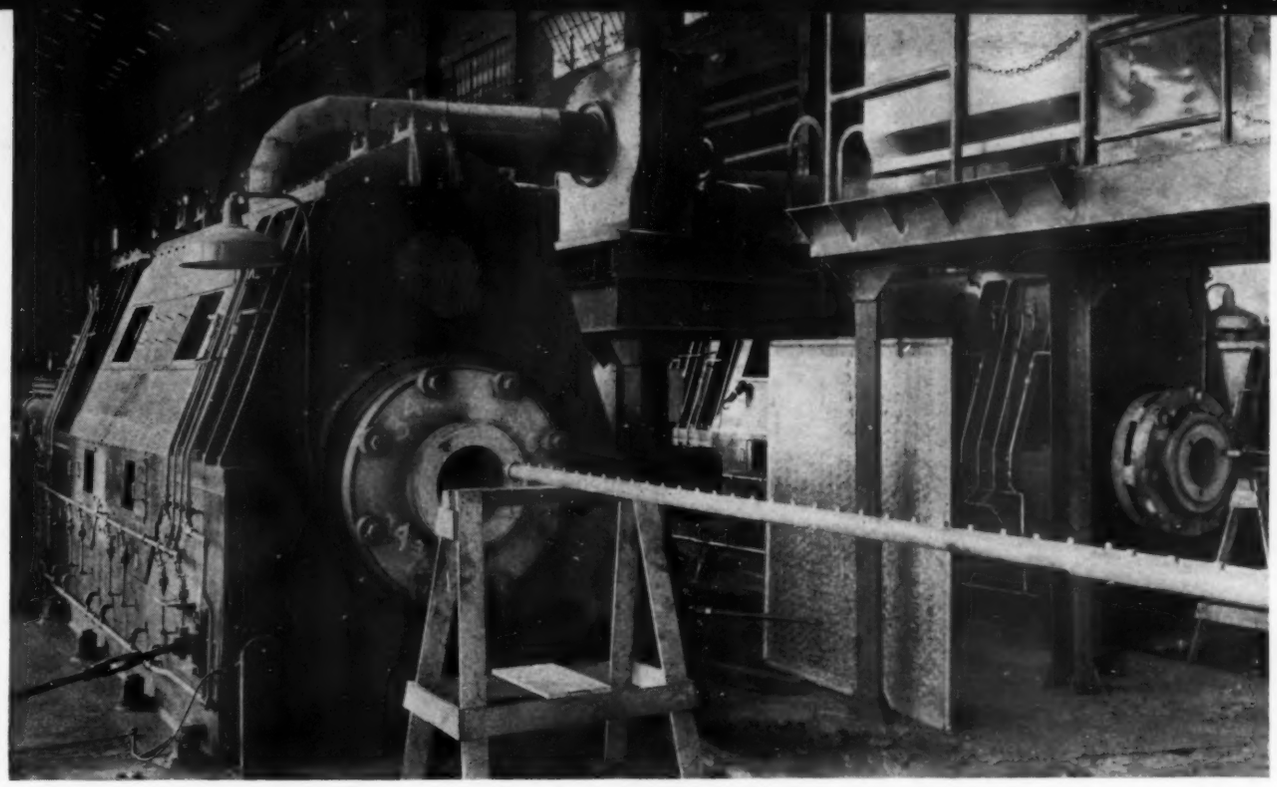
The research laboratory of this arsenal is one of the best in the country. Here were developed the widely used nickel steels; molybdenum high-speed tool steel, a substitute for the tungsten high-speed tool steel, and more recently the chromium-molybdenum-vanadium gun steels. Many important methods for testing materials were developed in this laboratory. In fact, the world's first tensile machine was built and still is in use here. Because of its then unique revelations, the use of steel was first introduced for making guns in the place of cast iron. The armor-piercing projectile was also created here.

The development of the most immediate consequence, together with centrifugal casting, was the development and protection of a cold-working process whereby the strength of the steel itself was increased. After the gun tube is cast, bored and rough-machined, it is put into a thick-walled cylinder and water is pumped into the bore. The pressure is raised until the diameter of the bore is materially increased and the elastic limit of the steel almost doubled. This treatment puts the layers of steel nearest the bore into a permanent state of compression through the contracting force of the outer layers. It is the same effect as is obtained in the built-up gun by shrinking the jacket and hoops onto the tube. Close to 100 percent increase in gun powder charges and a substantial increase in range are thus obtained without increasing the wall thickness or weight of the cannon. The ordnance engineer gains two important characteristics to work with—increased mobility and greater range.

The gun casting building is long and wide. Platforms at both ends hold electric melting furnaces which are of the coreless-induction, high-frequency type. These vary in size, but each is only just large enough to hold the amount of steel necessary for the particular gun to be cast from it. Each centrifugal casting machine consists of a steel tube mounted horizontally on bearings and provided with a motor by which it is rotated. The machine will weigh from three to four tons. Into it is placed a steel liner or mold, bored out to the exact exterior dimensions of the gun to be cast.

When ready for pouring, the steel melting furnace is picked up by a crane and dropped onto a pouring car which operates on a track in front of a casting machine. After running the furnace up close to one end of the mold, a pouring box with a nipple is inserted between them. The nipple is thrust into a small opening in a cover that is bolted onto the end of the mold. The furnace is then tipped so that the molten steel will run into the pouring box and from there, through the nipple, into the mold.

The mold is rotated at high speed during the pouring. Furnace charges range from 450 to 5,000 lb. according to the size and type of gun. Shortly after pouring, the mold cover is un-



Centrifugal casting machines consist of a steel tube mounted horizontally on bearings and arranged for motor drive. Into the tube is placed a steel mold which is bored to the exact exterior dimensions of the gun to be cast

bolted and an hydraulic ram pushes out the red hot casting. This hot gun is removed by crane to a cinder bed where it is buried for slow cooling.

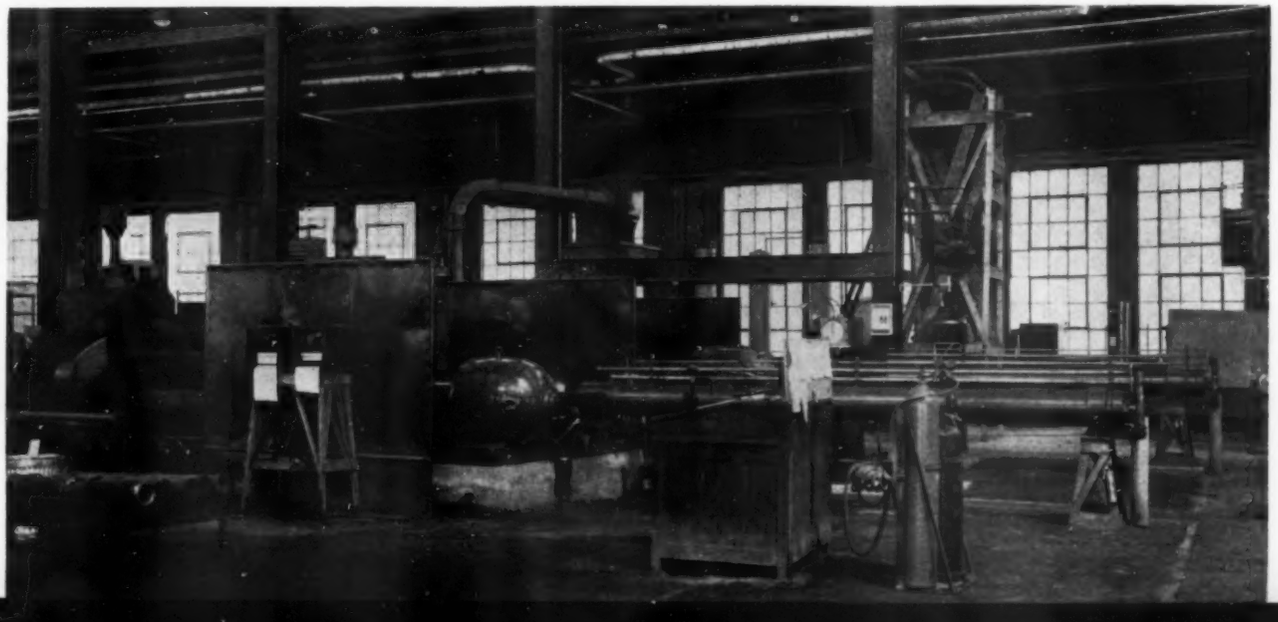
Along one side of this building is a row of carbottom-type furnaces in which the gun tubes are normalized. Air cooling (quenching) follows, after which the tube is heat-treated. This takes place in another building where are located a number of oil-fired vertical cylindrical furnaces. Cranes lower the guns into these furnaces. When up to temperature, the hot tube is given a differential quench by plunging it, large end first, into water several times insuring uniformity in physical characteristics. The tube is finally returned to the furnace for drawing and is then ready for machining.

Progressive development in gun lathes has finally resulted in a single machine which bores out the center and machines the exterior, both at the same time. Older equipment has also been modernized for this purpose. Turning lathes for finishing the outside surfaces of the gun tubes have been provided with six toolposts, so that six cuts are taken simultaneously. Machining time is reduced to approximately one-sixth. Boring lathes with twin headstocks and twin tailstocks make it possible to bore two guns at the same time. The molds for the centrifugal casting machines are also bored and machined here.

Among other achievements of the laboratory is a method of inspecting the crystalline structures of diamonds by refracted light from X-rays. This permits the discovery and rejection of imperfect stones. The use of X-rays and radium to photograph steel parts to disclose hidden defects was also developed here. A quick quantitative analysis of steel alloys is obtained by viewing their spectrums through a densitometer. These spectrum lines are photographed for a permanent record —26 different spectrums being put on a single photographic plate.

While welding has been advanced to the point where the actual weld is as strong as the parent metal, the area adjoining the welded seam is all too frequently weakened by the process. In a study of the causes and cures of this defect, dilatometers are employed to measure the dimensional changes of increasing and decreasing temperatures to evaluate various steels in the heat-affected zone.

At the rear end of each centrifugal casting machine is the main drive motor for the mold tube, and an hydraulic ram which pushes the red-hot casting out of the mold when the casting operation has been completed



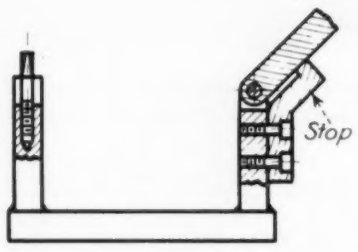
Jig and Fixture Details—III

BY JOHN G. JERGENS, CLEVELAND PNEUMATIC TOOL COMPANY

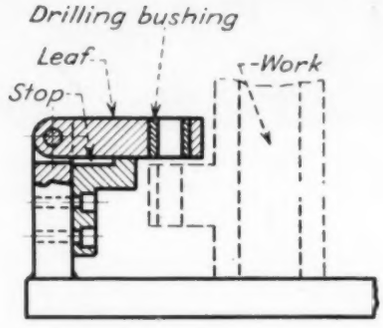
THE DRAWINGS on these pages deal with several types of standard details which can be used to advantage in the design of jigs and fixtures.

Some of the drawings are concerned with the jig leaf, the leaf stop, leaf clamp, and with several methods for attaching a leaf which is to swivel. Other details include a clamping method for several round bars, and for a movable slide. A few indexing mechanisms are included. Additional examples of index locking devices will be found in an earlier article (*AM*—Vol. 85, page 1312).

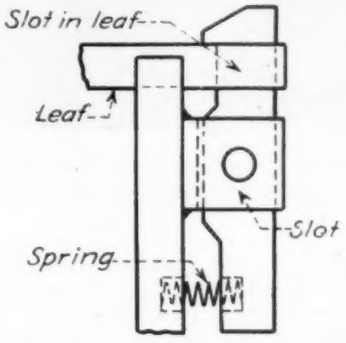
Numerous adaptations of these basic designs can be made to fit a variety of requirements.



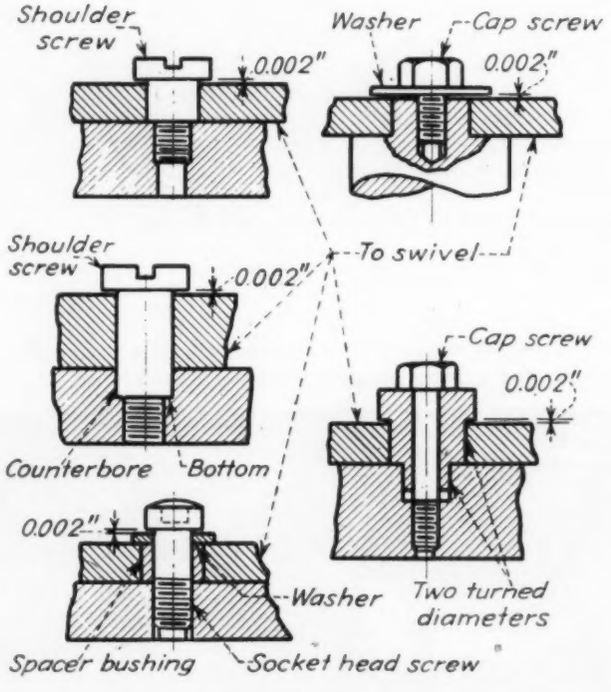
This leaf stop, intended to keep the leaf from dropping down when in the open position, is screwed to the side of the jig to which the leaf is hinged



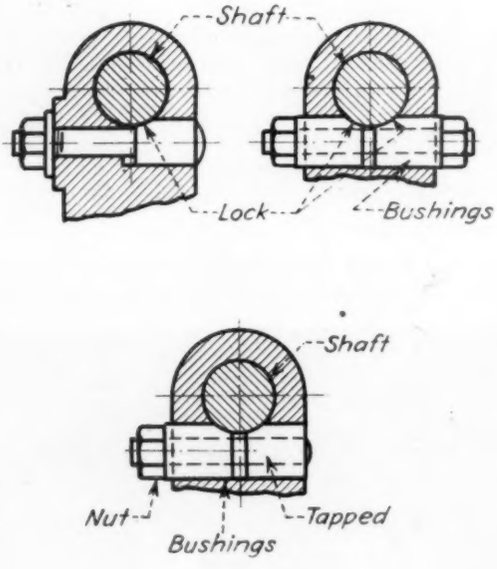
A drill bushing in this leaf is held in the proper position by a stop fastened on the inside of the member which holds the leaf



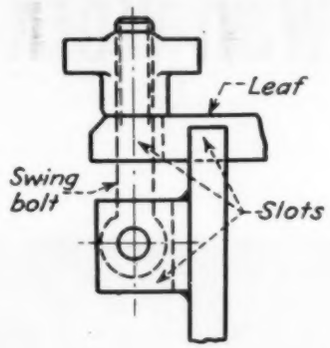
Pressure against the bottom of this lever releases the leaf from the lock. In closing, the leaf drops down into a slot which serves as a stop



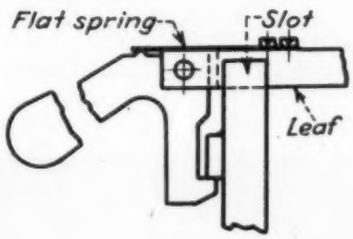
Several methods of attaching a leaf or clamp with clearance so that it will be free to swivel around the attaching point on the jig or fixture



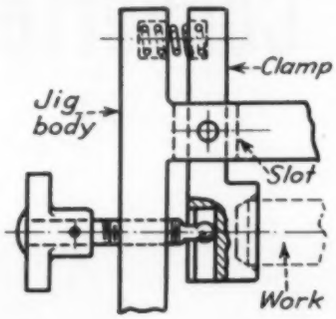
Three methods of clamping a shaft by surface pressure from the recessed portions of bushings which are tightened against the shaft



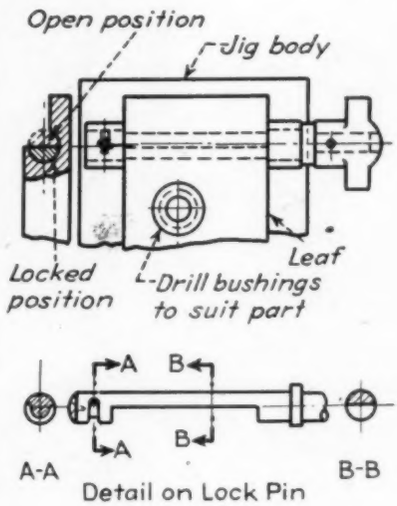
A secure fastening is provided by this swing bolt and hand knob. A few turns of the knob lets the bolt swing off to the side, freeing the leaf



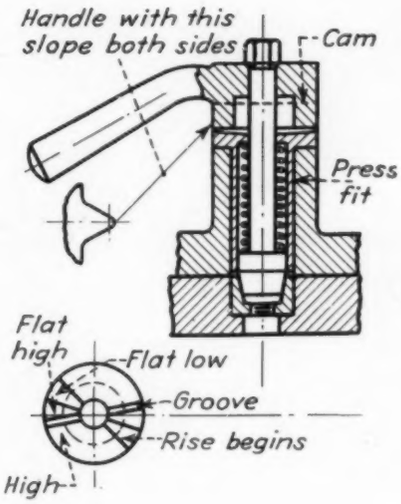
The lock, in this arrangement, is attached to the end of the leaf, and catches over a welded lug. A flat spring provides automatic locking



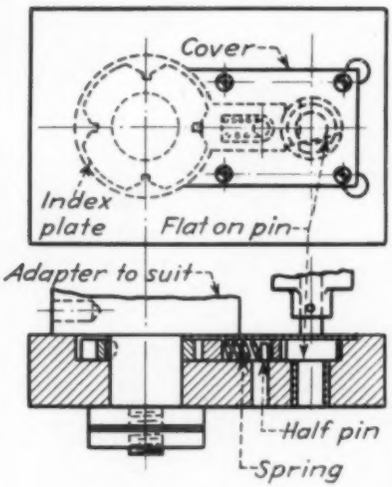
This clamp is actuated by the ball end of the knob-operated screw. The spring helps open the clamp when the ball end is withdrawn



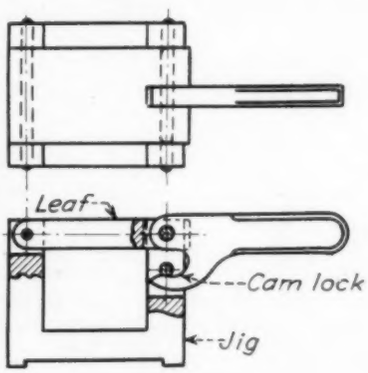
A more positive locking action is provided by this lock pin. Shaped like a semi-cylinder it locks the leaf by one half turn of the hand knob



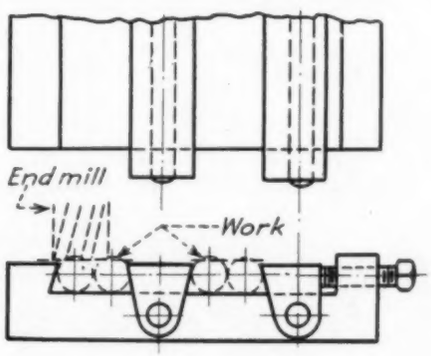
A quarter turn of the handle in this index lock raises the pin by cam action. A groove on the cam in the high position holds the pin open



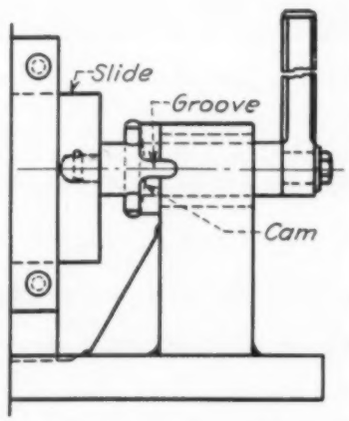
An indexing mechanism and lock in which turning the hand knob brings the flat side of the pin into position to release the locking arrangement



The leaf of this jig is locked by a simple form of the cam lock which fits over a pin in the jig body when the leaf is dropped into position



This clamping arrangement for round bars requires only a single bolt to tighten the clamp. One clamping point is fixed, the others swivel



The movable slide of this fixture is clamped by a pin which rides across the cam surface. When unclamped, groove permits withdrawal of slide

Converted Lathes Win War Work

BY BERNARD DARCY, NEW YORK ORDNANCE DISTRICT

Used engine lathes are completely knocked down and rebuilt to operate as precision special purpose machines. Here the bearings for the spindle are scraped while the lathe bed is lapped

One plant is now solving the screw machine shortage by converting 90 used engine lathes into special purpose machines

IT HAS BEEN SAID that this is a screw machine war. As far as the production of ammunition is concerned, this is largely true. Today one firm is experimenting with a new approach to the problem of finding adequate screw machine capacity.

This firm is working on a contract for one of the more difficult fuze items which requires a large turning capacity. For this job they are using 90 engine lathes and not one automatic screw machine.

While it is true that every toolroom uses one or more engine lathes as general purpose machines, the use of 90 of them to make a continuous productive unit is relatively new.

The lathes were bought second hand and completely rebuilt. The engineering department redesigned the lathe heads while the toolroom worked three shifts on one- and two-operation tools.

A large area was devoted to rebuilding the lathes. The heads were taken off and the bearings scraped. Shafts were reground. Carriage screws were taken out and hand lever substitutions made. The lathe heads were scraped and lapped.

In many cases a change was made from belt to individual drive. Tail stocks were eliminated, and a turret and cam-operated cross-slide was designed for use instead. Quick-opening collets were built into the heads.

It was necessary in buying the lathes

to get those that had a hole in the spindle for bar stock of whatever size the various fuze components required.

The job, when finally set up, will utilize as many women as possible, not only on the assembly lines but on the lathes as well.

Saw Necessity of Conversion

This experiment was undertaken after the potential screw machine capacity in the New York Ordnance District had been largely converted. Prior to the war, manufacturers who had 60 percent or more of the required quantity of single- and multiple-spindle automatics to do a particular job were approached with a view to conversion. For the most part such firms saw the necessity of conversion and had the shop brains necessary to retool to fit new requirements. In such cases the remaining screw machine requirements were set down in their proposals on the basis of a machine tool shortage or as components to be subcontracted. In some cases the cost of these short machines was to be absorbed by the bidder and in other cases by the government.

Unit prices of items were competitive with those in other ordnance districts throughout the country. Contracts were let for many ammunition items, but it was found that 65 percent of the contracts placed went to 20 percent of the total number of prime contractors for ammunition in the New York Ordnance District.

The reason for this concentration evidently was the lack of suitable production machinery in the other plants. Where a plant had one or possibly two multiple-spindle screw machines they were of no great value to us, except as subcontractors. We needed facilities with stability, background and a majority of the necessary tools.

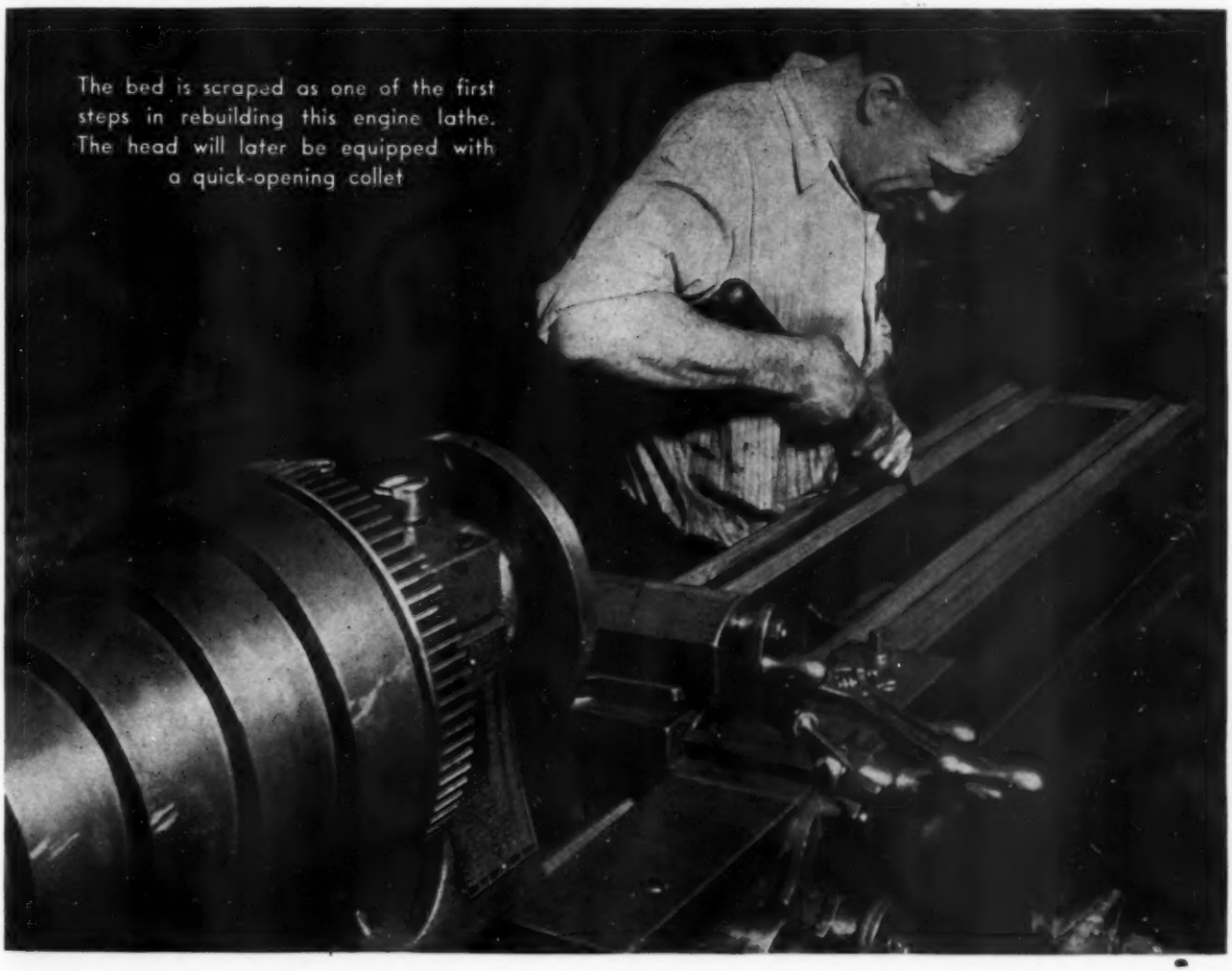
In connection with items requiring single- and multiple-spindle screw machines, Air Corps and Navy were in a more enviable position than Ordnance. Priorities for ordnance ammunition were not as well placed as those for the other services. Manufacturers also found that higher priorities could be obtained on components requiring wider tolerances than those allowable on ordnance material with the result that they were reluctant to enter a program which (1) made it necessary for them to recondition their machines to hold our tolerances, and (2) made the delivery of raw materials doubtful.

Such items as primers, fuzes, boosters, shot and shell require Class 2 and 3 threads and tolerances on some components of 0.001 in. and 0.002 in. We found that many manufacturers were not sufficiently pliable to work to our confined requirements. They were kept sufficiently busy making other materials that went either directly or indirectly into defense, and it was natural for them to go along in the easiest way.

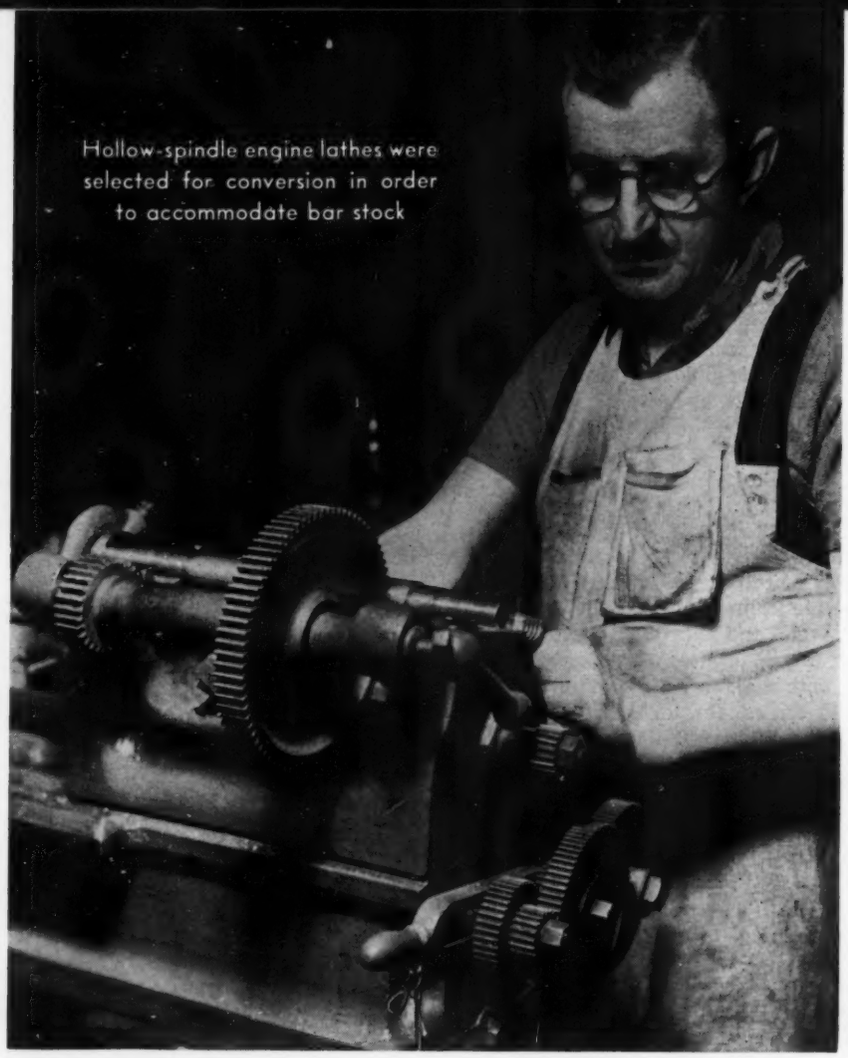
Turret Lathes Considered

In February of this year we relaxed our method of determining suitability and named facilities who had some of the qualities essential to getting out a job. We knew that these new plants would require a large quantity of critical machine tools. After the bids were in it was found that with priorities on short machines, production on items could not be foretold with any degree of accuracy. In some cases such projects were so loosely bound that they had to be abandoned.

The next possibility we investigated



The bed is scraped as one of the first steps in rebuilding this engine lathe. The head will later be equipped with a quick-opening collet



Hollow-spindle engine lathes were selected for conversion in order to accommodate bar stock

was to use companies with a lot of turret lathes and with a complement of small single-spindle automatics. A survey of the files of these companies revealed that they, too, were tied up on war work.

The next alternative was the utilization of single-purpose shell turning lathes. Bidders on ammunition items would necessarily under these conditions show a machine tool shortage of almost 100 percent of the requirements for the specific job. The cost of these machines was to be written off either at the government's expense or on a five-year amortization plan. Bids on this basis were always high. Even without amortizing the cost over five years single-purpose machines build up the contract price.

Idle Engine Lathes Considered

It was then suggested that the government buy some existing idle bench and engine lathes, set them up in a single space and build them into single-purpose machines with the primary object of getting some work out. If the initial experiment worked, it was thought that a series of small arsenals could be established here and in the other ordnance districts.

Lt. Col. Chester Mueller, chief of our executive division, and Lt. Col. Ross went along with the idea in principle, but Col. Ross suggested that some manufacturer be given the opportunity of entering the program rather than the government.

Acting upon this, the files of the Facilities Section of this office were combed for a likely company. The qualifications were, in order of their importance: an excellent toolroom, shop brains, engineering, at least ten existing idle engine lathes, financial stability and, finally, a desire to buy more lathes and convert them to single-purpose machines to produce ordnance metal.

After a firm had been selected, they were asked to bid on one of the more difficult fuze items which not only required a large turning capacity but, in addition, would give them a considerable amount of assembly work. Their method of arriving at a unit cost was as follows: From some stock on hand they were able to make a physical sample of the item and ran production studies in an empirical way, making allowances for differences between lathe chucking and the quick-change collets which they were going to build into the second-hand lathes; carriage tooling instead of turret tooling which again they would build. Finally, they presented their proposal, bringing with them the physical sample they had made.

The production schedule which they established in their proposal was as good as any received in this office for the item. Under the machine tool shortage they asked for no government funds but said they would use 90 engine lathes instead of automatic screw machines. The unit price set down for the job compared favorably with other proposals received in this office. Finally, this company was awarded a contract in excess of a million dollars.

The labor rate will be considerably higher with this method than in the employment of six-spindle automatics, but the fact that this company's proposal was in line with all other proposals received here means that they anticipate getting high production.

If this company is as successful in the production of the fuze as its beginning enthusiasm and work seems to indicate, it may bring a turning point in turning capacity.

Keep Your Lights Clean

Better performance and greater efficiency at lower operating cost are the direct benefits of a complete inspection and maintenance program for industrial fluorescent and incandescent lighting, according to Westinghouse engineers. In addition, critical materials such as aluminum, copper, bronze and nickel are conserved, and the normal life of the fixtures is substantially increased.

Luminaires should be cleaned frequently. If dirt is allowed to accumulate on reflecting surfaces and lamps, illumination may be reduced 30 to 50 percent in a short time. For maximum efficiency, reflectors must be thoroughly cleaned with soap and water. When concentrating high bay reflectors are used, dirt not only reduces total light output, but alters light distribution.

When lamps fail, they should be replaced immediately with the proper size and type. In larger plants the most effective method is to have a relamping crew patrol the plant regularly. When fluorescent units are used, the lamp fails when the emission material on the electrodes is used up. At this point the lamp will flash on and off and must be replaced promptly to protect the starter and ballast.

For most efficient lighting with filament lamps the luminaires should operate at the rated voltage marked on the bulb. Socket voltage below the rated value will reduce light output in the ratio of about three percent for every one percent in reduced voltage. A high voltage will increase light output and lumens per watt, but will adversely affect the life.

Machine Tool Builders . . .

the men behind our war production achievement

IT TOOK GERMANY six years to get ready for this war, and Japan even longer. But in less than twenty-four months American industry, starting from scratch, has caught up with and surpassed the war production of the Axis.

When France fell in June, 1940, we unfortunately had no gigantic munitions makers, like the Krupp or Skoda works, to turn to. We had been devoting our attention to making refrigerators and vacuum cleaners and motor cars and lawn mowers. Ordnance output for our Army was a mere million dollars a month. A sad commentary on our National state of mind and our lack of responsible political leadership.

Yet during June of this year, our industries, transformed from peacetime pursuits, produced close to a thousand times that amount. A thousand-fold increase in two years!

The same spectacular gains hold throughout our war program — for ships, planes, guns, tanks, a thousand items. We are well on our way toward the 60,000 planes, 20,000 anti-aircraft guns, 45,000 tanks and 8,000,000 tons of shipping that the President asked us to produce in 1942, and toward the much larger production projected for the year 1943.

We are well on our way thanks to a number of factors, one of the most vital being the extraordinary job done by the machine tool industry. For it has equipped America's metal-working shops with the tools they need to turn out the vast quantities of war weapons.

The machine tool industry's importance springs from the fact that almost every metal product, from mechanical pencils to giant guns, is made with machine tools. They transform pieces of steel into parts for automobiles, farm implements and radios—and for airplanes, guns and tanks.

The Garand rifle, highly praised by General MacArthur at Bataan, has 72 metal parts requiring 1040 separate cutting operations on machine tools. A 40-millimeter gun mount is made up of 1500 separate parts, built to the tolerance of a Swiss watch. Each part must be machined, not once, but several times.

No wonder that when the American defense program was undertaken two summers ago, the American machine tool industry was the first to be called into service. Ninety-five thousand machines were wanted as quickly as possible from 250 builders who in peacetime had produced some 25,000 machines a year.

But the demand did not stop there. The Army, the Navy and the Air Force kept asking for more as the war production program was expanded again and again. Nor was that all. The entire anti-Axis world besieged Washington with urgent requests — from London to Moscow, from Ottawa to Chungking.

To a man the machine tool builders responded. New factories and additions to old plants were built, with deliberate disregard of the prospect that all these sharply expanded facilities could not be used after the war.

To increase output from existing plants practically every company went to two long shifts or three short ones. The industry's work-week was greatly extended. From the beginning of our effort, it has been the longest of any industry.

Working forces were enlarged from 40,000 to 110,000, and this latter figure does not include tens of thousands of employees with sub-contracting firms. Though machine tool building requires a higher degree of individual skill than most products, "learner" courses have been set up to train men quickly. Over 15,000 men and women now are in training.

The machine tool builders were among the first to go in for sub-contracting. They have farmed out parts, subassemblies and complete

machines right and left. To meet their needs, for example, repair shops of carpet mills are making milling machines, a laundry machinery company is producing radial drills, and an automobile body builder is making planers and boring mills.

Machine tool manufacturers quickly shelved peacetime practices to concentrate manufacture on the sizes and types of machines critically needed for the war program. They adopted mass production methods wherever possible, although machine tools are essentially a tailor-made product. They sent their sales engineers, as did machine tool dealers also, to hundreds of munitions makers with invaluable advice as to tooling up most efficiently for their particular jobs.

The swift action taken by the machine tool builders shows what private enterprise can do to meet a national emergency. They were the first to institute a voluntary system of priorities.

All of this involved an almost explosive expansion of the industry. Machine tool builders produced an average of only 7,500 machines a year from 1931 to 1934. In an ordinary year, output totals 25,000 machines. But in 1940, it rose to 112,500, and in 1941 to 187,500.

The 95,000 machine tools wanted for the original defense program were built and delivered within eight months.

Today more than 1,000 machine tools are being shipped to war factories every twenty-four hours, and for seven days a week. Each month's output exceeds that of an entire normal peacetime year and is five times that of the depression year of 1932. And each succeeding month is shattering all previous records.

It is this amazing performance that led Under Secretary of War Robert P. Patterson to declare that "machine tools are the foundation on which our production structure is built. American machine tool men are doing a stupendous job. Machine tools are now being turned out at a rate of $1,380,000,000 a year. Machine tool designers have worked to improve tools so much that machine tool effectiveness today is one-third to one-half greater than it was in 1930. Our production today is 16 times what it was—in capacity to cut metal—at the peak of the World War."

The results of this performance by this key industry, so satisfying to the Nation, do not spring wholly from the numbers of machine tools produced. They stem also from their improved quality and greater productivity.

Today's warfare differs radically from that of 1917-1918. It calls for mechanized weapons so complicated in design and built to such a fine degree of accuracy that they are beyond comparison with the weapons of a generation ago.

Machine tools, completely redesigned during the depression years, are meeting these new and exacting requirements. In addition, thousands of machine tools of special design, without counterpart in peacetime work, have been built.

The record of the war industries most directly dependent on the machine tool industry speaks for itself. One tank manufacturer alone is producing more than thirty big tanks a day. A midwestern plant is completing 35 anti-aircraft guns a day, round the clock without interruption. A tank engine factory, tooled up to make 650 units a month, is actually building over 1500 a month. Demolition bombs, destined for Berlin and Tokyo, are being made by the tens of thousands every month. Machine guns are being produced at a rate of 50,000 a month.

These manufacturers, all machine tool users, are far in advance of the timetables set for them.

All this is good news for the American people and bad news for the Axis. It is proof that American industry, with each individual and specialized industry doing its part, is living up to the faith put in it by the American people.

But it is more than that, too. It is a guarantee of our confidence in the peacetime future of American industry and of the free enterprise system under which this miracle has been wrought.

Perhaps more than anything else, the foundation of that confidence must be faith in the farsightedness, the ingenuity, the engineering and designing skill, and the managerial know-how of the machine tool makers.

On them we depend for the most essential tools of the post-war production economy. Without them, our vision of better living standards and full employment through more efficient production and distribution can never be more than a vision.

What they have done as the toolmakers for war is proof of what they can do as the toolmakers of peace. How they have done it as free men is a demonstration of what free men will do.

James H. McGraw, Jr.

President, McGraw-Hill Publishing Company, Inc.

This message is appearing in all McGraw-Hill industrial and business publications, reaching over a million readers.

Injection-Molding Methods

BY HERBERT CHASE

Ford's plastic production fills many military needs and saves metals needed in other products

BEFORE THE production of commercial cars and trucks was stopped early this year, the automobile companies had substituted plastics for many metal parts, especially for decorative applications. Metal shortages furthered the use of plastics, and experience gained in their use for automobiles has resulted in their wide application in military vehicles.

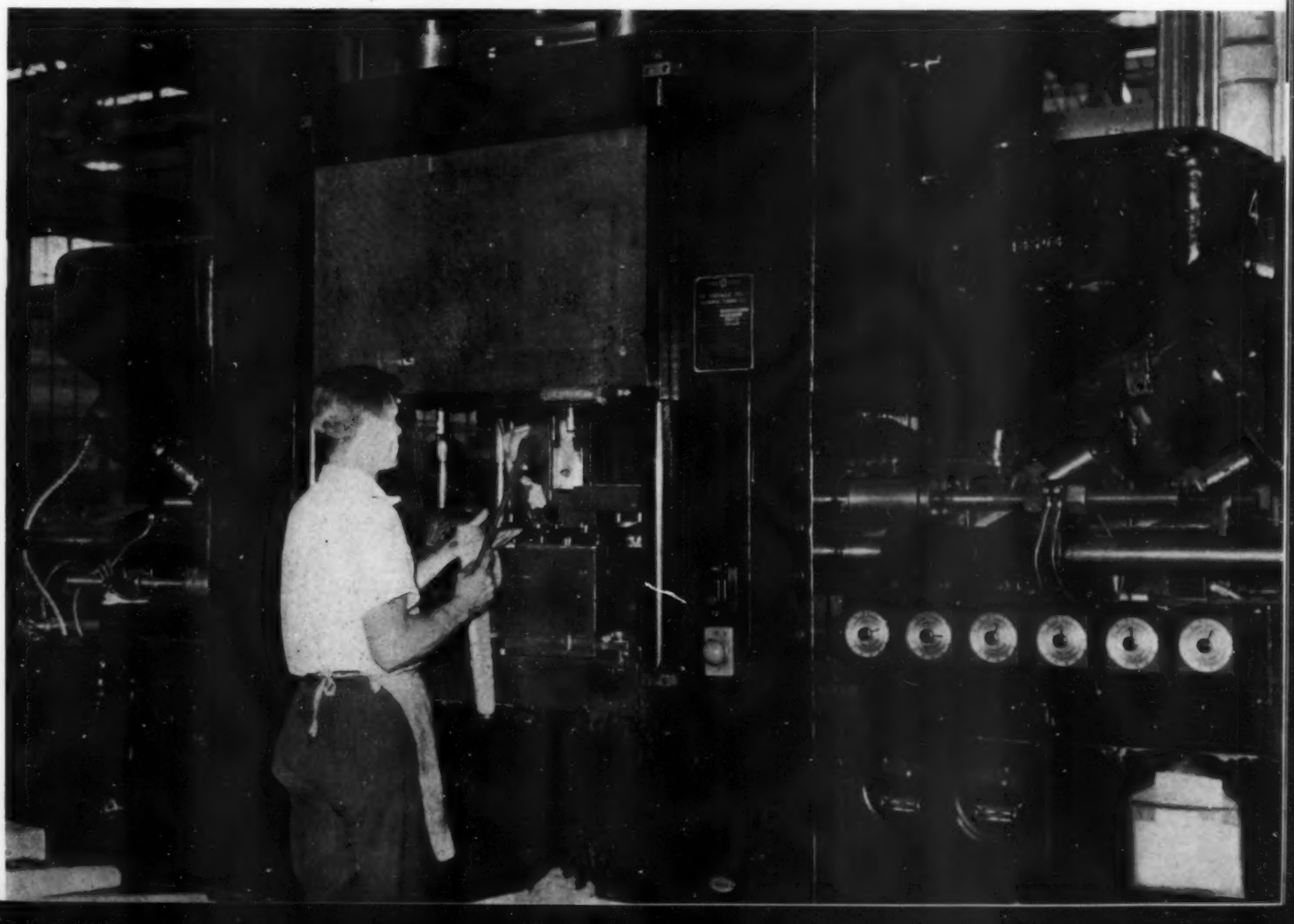
As an ardent advocate of plastics, the Ford Motor Company has operated its own molding department in the River Rouge plant for many years. All molding equipment is self-contained and does not depend upon separate hydraulic equipment—each press has its own pump. Heating plastics is done electrically, doing away with steam and hot water lines. All molding described in this article is done by the injection method, using, of course, thermoplastic materials.

At present, all injection molding is done with cellulose acetate-butyrate plastic (Tenite II) which has taken the place of "straight" cellulose acetate formerly used, primarily because the former is more stable dimensionally. Molding procedure is practically the same and so is appearance.

Granular plastic is used and fed automatically from hoppers which are filled by hand. Molding cycles are semi-automatic, with the timing of the cycle events determined by the setting of controls supplied with the machines. Once the machine has been set up, and is operating as intended, operators have only to start the cycle by pressing a button and to remove "gates" or clusters of moldings when the mold opens; however, the machine can be stopped instantly at any point in the cycle. In some instances, mold clusters are dropped in water immediately after removal from the mold in order to cool them quickly and to minimize shrinkage. Where time permits, the operator breaks or cuts moldings from the gates, using pliers, and places the pieces in tote boxes; the sprue and runner are put into other containers for salvage. Most of the moldings are light neutral tints, but a small proportion are in dark colors or black.

Among molds having several cavities of small size is that for the gear-shift ball which is hollow and has to be molded in two halves. The mold has four cavities for each half, thus making eight moldings in each 26-sec. cycle. Another eight-cavity mold produces

This 500-ton HPM injection molding machine is equipped with dies for producing two unusually large instrument bezels per "shot" from four injection units



Knobs are stamped with lettering and decorations to minimize mold cost. A hot die presses colored cellophane into recesses formed by the die. The parts, loaded in a dial fixture arranged for intermittent motion, can be stamped at the rate of 1,500 pieces an hour

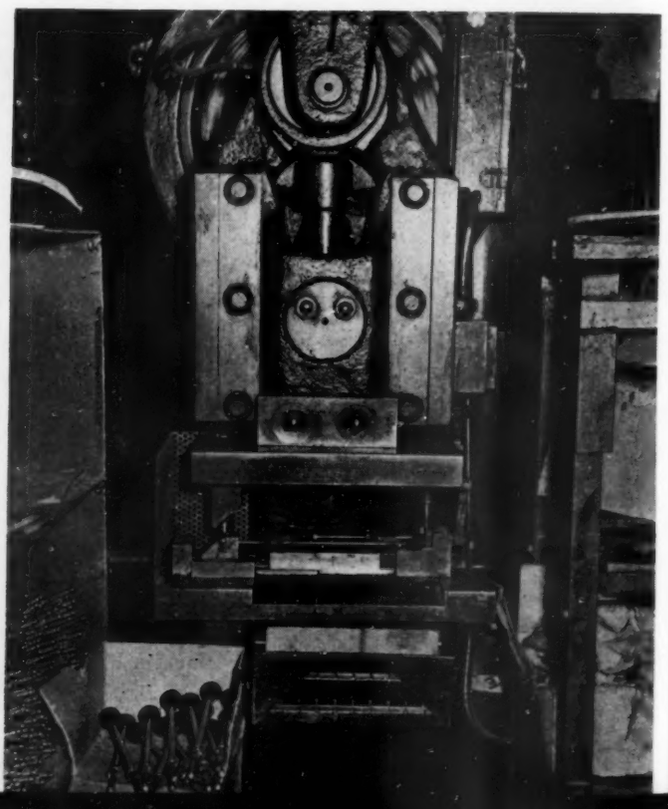
eight escutcheons in each 22-sec. cycle. This is typical of some of the smaller parts having sections thin enough for rapid cooling in the molds. Moldings produced in this manner are placed in tote boxes and are shifted across an aisle to machines on which various finishing, polishing and assembly operations are done.

As the plastic used is not of the low-cost type, salvage of gates, runners and rejects is important; hence, the scrap is carried to a recovery area where it is hand sorted and run through a magnetic machine to remove any metallic material. Pieces which are clean and of light color are reground in a rotary machine and subsequently mixed with new granuals for return to molding machines. Any scrap which is not clean enough for such reuse or which is dark in color is sent to another department for grinding and admixture of color. Later it is used in molding small black or dark parts for minor hidden applications. In the recovery area there is a thermostatically controlled machine for warming plastic before it is sent to the molding machines. This drives off any moisture present and thus helps to facilitate and promote uniformity in molding production.

In the area devoted to the finishing and assembly of moldings there are several types of polishing machines. Some of these machines also remove light flash. A wet belt sander, for example, is used to remove the flash from the

Radio grilles are produced on a 12-oz. Lester machine having a single-injection unit. It uses one of the few single-cavity molds employed in the department, but turns out 60 grilles an hour. A molding from which the flash has not been removed is seen at the right.

Many plastic knobs require metal stems which are grooved on the end and pressed into the plastic. The knob and stem are set in this fixture, one end of which is stationary. The stem rests against the moving beveled end so that down stroke of the ram forces the stem into the knob



periphery of escutcheons and to give the edge a better finish. A hand ho.der on which the work rotates is used for this operation which is accomplished at the rate of 1,700 pieces an hour.

Many injection-molded knobs are polished on an automatic buffing machine equipped with three wheels under which the knobs are passed successively after hand loading on a dial fixture which rotates slowly. Vertical spindles which carry the work are designed to rotate the work as it passes the wheels. The operator of the polishing machine loads and unloads about 1,350 knobs an hour without stopping the dial.

Bezels Polished Automatically

Instrument bezels are among the large moldings which require polishing. They are handled by a Universal automatic buffer which advances the work on forms carried by a belt under five polishing wheels and subsequently returns the forms to the loading position. Right and left sections of the bezel are applied to alternate forms and the wheels are set, of course, so as to contact all surfaces needing polishing. About 600 bezels an hour can be polished in this set-up.

One of the few jobs of machining of thermoplastic parts is done on the hollow ball for the gear-shift lever. The knob is molded in two halves and a groove is cut in a turning operation after the halves have been cemented together under light pressure applied by a spring while the cement is drying. The groove is cut because it constitutes an undercut which it is not feasible to mold. Subsequently, the knob is pressed onto the metal shank of the lever by inserting the two parts in a die in a punch press. Production is 500 pieces an hour. Before this operation is performed, however, the knobs are loaded into a tray under four heater-lamps which warm the plastic and prevents splitting the knob when the lever is forced into it.

Many of the other knobs, which are smaller and are molded solid, also require metal stems. The latter are grooved on the end which is pressed into the plastic, somewhat like a broach, and sufficient pressure is applied to insure a tight and permanent grip on the stem. In some cases, stems are applied in special machines equipped with dial holders and a ram which forces the stems into place at the rate of 750 an hour.

A few of the plastic parts produced are for truck applications. Among these is a horn button designed for fastening to a metal spider by drive screws. The latter are fed from a magazine to the driver bit automatically in a drill press. With this set-up, three screws per piece can be driven into some 800 horn buttons an hour. Another operation performed in a drill press is finishing the edges of holes cored in bezels, where flash has to be broken away. The press spindle is provided with a rotating file which does most of the cutting required, after which a small wad of steel wool, picked up on the lower end of the file, smooths off any marks left by file teeth.

Some bezels have integral projections or lugs molded on the back face. Some of these lugs require a notch, which would constitute an undercut if molded; hence, the notch has to be cut. This is done rapidly by traversing the piece across a saw or milling cutter driven by a light machine. The edges of some large openings cored in bezels are finished on narrow belt sanders in which the belt runs over an idler pulley small enough to pass through the opening.

Various other simple finishing operations are performed on the numerous injection molded parts, but the foregoing are representative types of work needed in finishing. It is often said that plastic parts come from the mold practically ready for use, yet every molding plant has a finishing department for flash removal, polishing and similar operations.

To insure acceptable appearance as well as freedom from flaws, all important moldings are delivered to an inspection department. There the parts are loaded onto a belt conveyor which carries them past the various inspection stations. Some 72,000 moldings can be handled on the inspection lines every eight hours.

Motor-car escutcheons are molded in clusters. The time cycle is 22-sec. This is typical of many parts having sections thin enough for rapid cooling in the molds. The escutcheons are then ready for trimming and polishing

Two-Spindle Heads for Fuze Parts

When you can't buy tools for war production, make them. That's what this Canadian company did on a fuze contract

TWO OF THE small brass parts which go into the percussion fuze for the 40-mm. high-explosive shell require the drilling of two small holes 0.650 in. apart in one case and 0.460 in. apart in the other. Because of the difficulty of obtaining quickly two-spindle drill heads with such close center distances, the company contracting to make these fuze for the Canadian government decided to develop and build special heads for these parts. The requirements were brief. The heads must be small enough for use in sensitive bench-type drills, they must be accurate because of the small allowance on the specified center distances, and they must be designed so that they will be capable of operating at the high speeds required for efficient operation of 0.50 to 0.100-in. diameter drills.

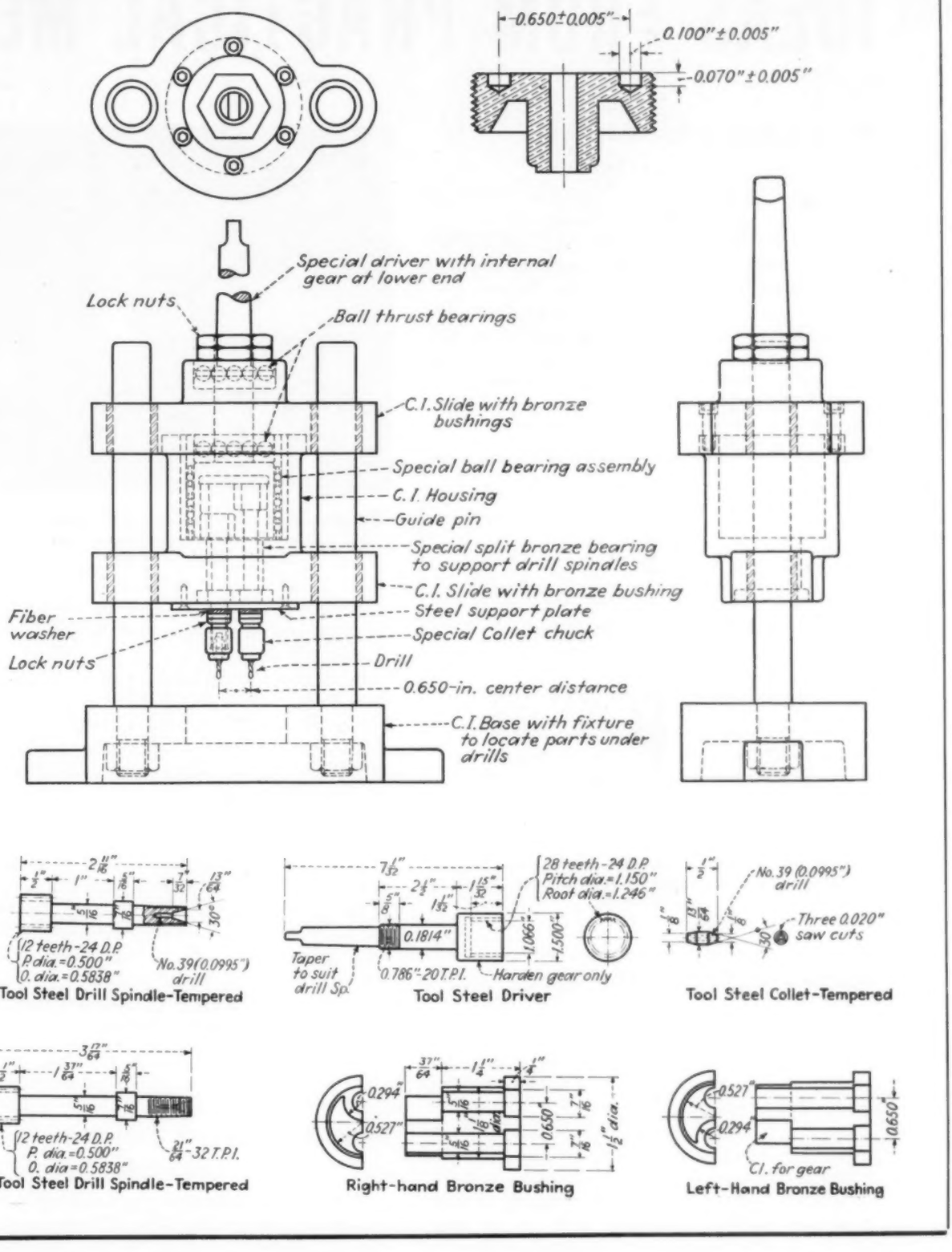
These drill heads now have been in service for some time, and while it has been found that the main bronze bushings which locate the drill spindles have a tendency to wear and permit the spindle to spread after having been in service for some time, it is a simple matter to make new bronze bushings and replace them when the wear has reached the maximum allowable.

Details are shown for the drill head developed for drilling two 0.0995-in. holes at a center distance of 0.650 in. The smaller head, which drives two 0.050-in. drills at a center distance of 0.460 in. at approximately 5,000 r.p.m. is shown in the drawing below. It will be noted that the special split bronze bearing which locates the drill spindles is arranged to support these spindles so that the gear on the end of the short spindle drives from the lower section of the internal gear on the driver. The spur gear on the end of the long spindle is supported above the gear on the shorter spindle, so that it contacts the internal gear on the driver on the upper tooth surfaces. The entire drill head is inclosed between two cast iron slides in a cast iron housing, each slide having two bronze bushings which fit guide pins fitted in the base of the unit. This base also serves to support the work locater.

Because of the close center distances involved, special collet chucks were developed. There is not much unusual about the design of these chucks. They have proven quite satisfactory in service. Each spindle is drilled back of the collet fit with the same diameter drill which will be used in the chuck. This serves to center the drill in the spindle and to provide for adjusting each drill so that the proper drill extensions can be obtained. Depths drilled with these units, as well as the center distances, must be held within 0.005 in.

Adequate lubrication with a carefully selected oil is essential if drill heads of this design are to be operated at high speeds on continuous production. Also, they should be checked over frequently by the department foreman or set-up man to insure that they are repaired as soon as the fiber washers or the split bronze bushing become worn to the extent that excessive play develops in the spindles. Loose bearings will permit the spindles to spread apart under drilling pressure and result in scrapped work.

Designed and built especially for drilling spanner wrench holes in the end of a fuze part, this high-speed, two-spindle drill head carries two 0.050 in. drills at a center distance of 0.460 in. It is mounted in a standard bench-type sensitive drill press and develops a spindle speed of approximately 5,000 r.p.m. With adequate lubrication, replacement of the bronze bushings which support the spindle is necessary only after considerable use in the shop



Assembly and details of the drill head employed for drilling two 0.0995 in. holes at a center distance of 0.650 in., are given above. Note that ball bearings keep the steel driver in position, and that the two drill spindles are held in position by a special split bronze bushing. Thrust is taken against fiber washers which can be replaced easily when worn. The two drill spindles are supported by the split bronze bushing in proper position so that the integral gear on the end of each spindle will engage in the internal gear of the driver without interference with the other spindle gear

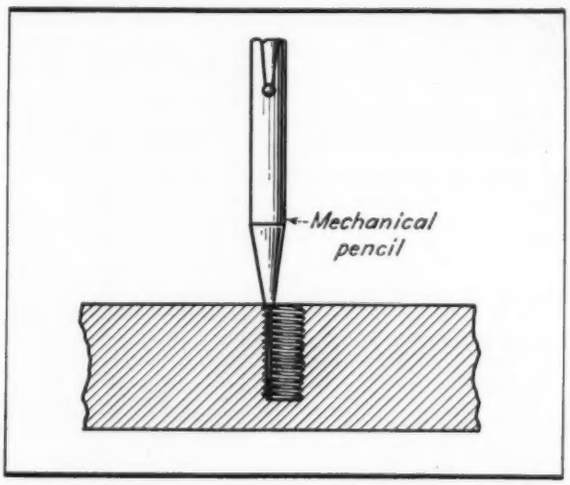
IDEAS FROM PRACTICAL MEN

Measuring Depth of Narrow Openings

BY THOMAS TRAIL

When it is desired to measure the depth of narrow openings in machine parts such as threaded holes or drilled holes which are not very deep and suitable calipers are not readily available, a mechanical pencil can be used as a measuring tool.

The lower end of the pencil is rested on the edge of the opening, while the lead is propelled down into the hole until it just touches the bottom as shown in the drawing. The length of the lead is measured with a rule to find the depth of the opening.



A mechanical pencil can be used when suitable calipers are not available, to measure the depth of a small hole

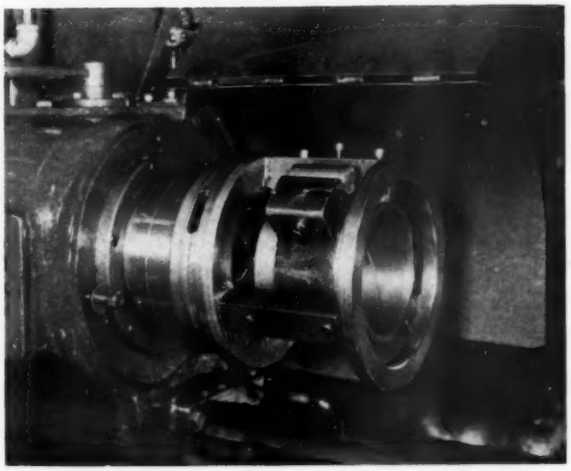
Non-Deforming Cylinder Boring Chuck

BY C. T. PACKER

Westinghouse Electric & Manufacturing Co.

Difficulty is usually experienced in maintaining roundness in the finished bore as a result of holding methods in previous operations. For example, a cylinder 6 in. in diameter by 6 in. long was to be turned outside and bored inside to $5.500 \pm .001$ in. The usual procedure is to start by using a 3-jaw chuck. In most cases the chuck pressure necessary to drive is sufficient to show a distortion of five or six thousandths on either bore or turn after removal from the chuck. By the use of conventional methods of machining a cylinder the distortion carries through to the finished product.

In a case where it is essential that the bore be round in a piece that is out of round on the outside, a chuck has been developed whereby three centering and support arms are bored the size of the finished



This special chuck using a spring steel band eliminates distortion when machining cylinders of a fixed diameter

diameter of the cylinder. Two of the supports are fixed, the other has release screws to provide for easy loading and unloading.

In the face of the three supports is fitted a $\frac{1}{16}$ in. thick by 3 in. wide spring steel band having clamp lugs at each end. The groove for the band is 1/32 in. deeper than the thickness which allows the band to lie in the clear during loading and unloading operations on the cylinder.

The cylinder is placed in the chuck. The band is clamped tightly around. Since the spring steel band is flexible it conforms to the contour of the cylinder but provides sufficient friction to drive the cut without distortion in the piece. After the clamp band has been tightened the clamp and cylinder is rotated until it stops against one of the supports which serves as a driver. The release screws are then tightened with pressure sufficient to hold the cylinder control but not enough to distort. Very satisfactory results are obtained from this type of chuck.

Height Gage Made From Micrometer

BY D. E. McDONALD

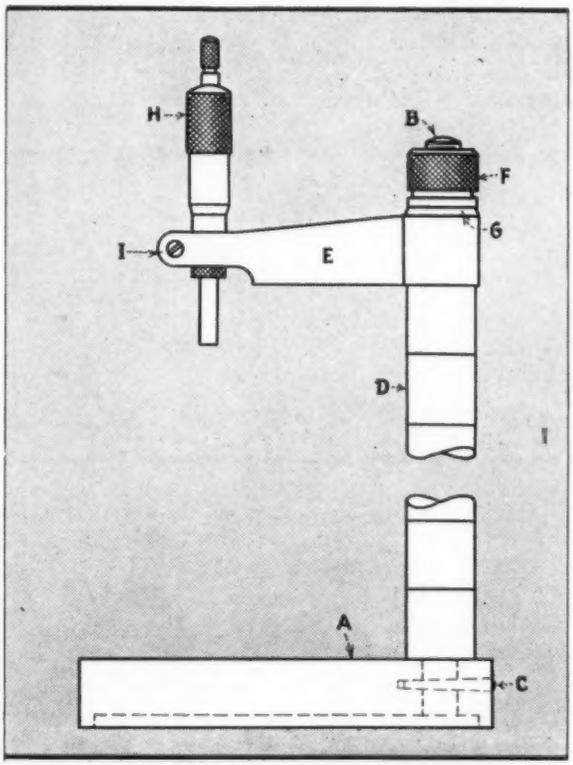
With commercial height gages difficult to secure, and perhaps beyond the means of some small shops even if they had a suitable priority, the height gage shown in the drawing will serve satisfactorily.

Base *A* is made of steel ground to 1-in. thickness. The bottom of this base is channeled out so that the actual contact surface is only at the edges. Rod *B* is hardened and ground. The upper end is threaded down for a short distance. This rod is pressed into the base and held in place by taper pin *C*.

Twelve space busnings *D* are made to fit over the rod. These bushings are hardened and ground to a height of exactly 1 in.

Micrometer support *E* has one end made to the same dimension as the space bushings, while the other end is bored to fit the micrometer spindle. This end is split so that when micrometer *H* has been properly located, it can be locked in place with filister head screw *I*.

The entire assembly is held rigidly together by knurled nut *F* and washer *G*. It is possible to make any measurement from zero to 12 in. on the base plate. If used on a surface plate, this can be increased to 13 in. by turning the micrometer support to one side. This unit can also be used for setting the height of planer and shaper tools by merely turning the micrometer support upside down.



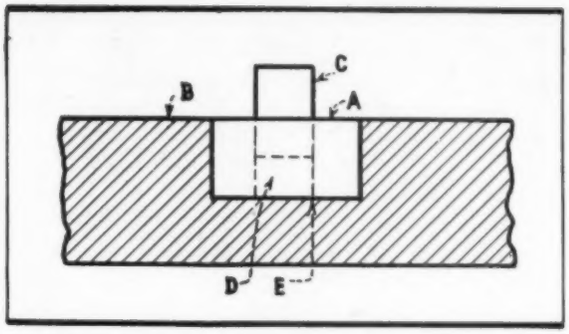
A micrometer is used in conjunction with spacer blocks to make this height gage which can measure any height from zero to 12 in.

Grease Removes Blind Bushings

BY JOHN E. HYLER

Blind bushings which have been pressed tightly into place can often be removed by the method indicated in the drawing. Bushing *A* is pressed in flush with the face of heavy cast frame *B*.

In order to remove the bushing, plunger pin *C* is turned out which will enter the bushing hole with a snug push fit. That part of the bushing hole indicated by *D* is filled with grease, so that the hole is about half full. Pin *C* is set into place, and carefully



Blind bushings can be pumped out of their seat by filling the hole half full of grease and then driving a pin into the bushing hole

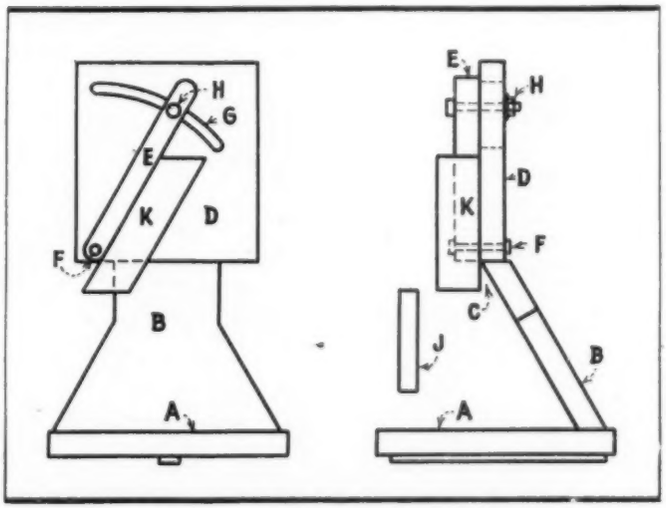
worked down until it rests upon the grease in the hole. The pin is then struck hard with a heavy hammer. The grease will be forced beneath the edges of the bushing at *E* and will exert a lifting force on the bushing. Repeated applications of grease, pin and hammer may be used as needed to pump the bushing out of the hole.

Fixture for Angle Grinding Dies

BY JOHN LOCK

A fixture like the one shown in the drawing is valuable for grinding angles on the ends of die sections and like work, especially in cases where perfect equality in the angles produced on two or more parts is required. While intended chiefly for longer work which must be supported above the wheel on a surface grinder, it can also be used for shorter parts. It may be welded together, but care must be used to get the face plate at exact right angles to the base.

Baseplate *A* has welded to it plate riser *B* cut to a tapered shape to reduce weight, and pitched at about



A fixture of this type, equipped with a swinging fence on the faceplate is useful in grinding angles on the end of die work

30 deg. from vertical in order to provide the necessary clearance at *C* for wheel *J*. Faceplate *D* is a departure from many fixtures of this kind, in that it accommodates swinging fence *E*, one end of this fence being mounted on permanent pivot pin *F*.

Slot *G* is cut in the faceplate. This is laid out by swinging arcs from the center of the pivot pin location, thus allowing bolt *H* to slide freely in the circular slot, and allowing the fence to be quickly set at any angle within the scope of the device, simply by loosening bolt *H*. The arc may be graduated in degrees, and a pointer arranged on the end of the fence, so that settings may be directly read on the faceplate.

Workpieces *K* may be held to the faceplate with ordinary clamps, but if it is desired a clamping unit can be made which will slide in a second slot similar to *G*, though the clamp slot may be straight, and parallel to a chord of the arc at *G*. In those rare cases when it may be necessary, compound angles may be ground accurately on the ends of work, by using the fixture principles shown, plus the incorporation of a faceplate which is tilted or which may be tilted at the right degree to incorporate angularity as to the thickness of the material being ground.

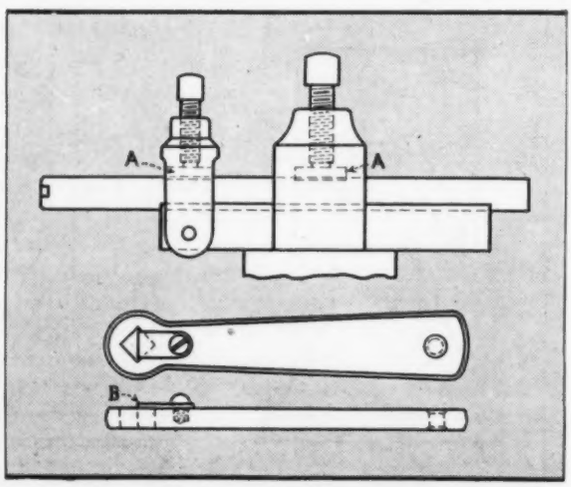
Holder For Small Boring Bars

BY MARTIN H. BALL

The boring tool holder to accommodate boring bars from $\frac{1}{4}$ in. to $\frac{1}{2}$ in. in diameter which is shown in the drawing affords as rigid a clamping as can be obtained for small bars due to their being of round form. But a small amount of clearance is required between the bar and the walls of the hole to be bored. It is clamped with two setscrews, with as short a projecting part beyond the tool post as the depth of hole to be bored will allow.

Two small grooved setscrew blocks *A* prevent the setcrews from marring the boring bars and add to the rigidity of the bars due to the longer bearing afforded; this makes the outfit less subject to chatter than most small bars.

The solid box type wrench is fitted with thin plate *B* which only partially covers the opening—thus leaving the position of the corners of its opening visible. This is shown with the plate secured with a screw, but the plate can easily be secured by spot welding, which is desirable if the wrench is hard to drill and tap. When used with the boring bar holder, this wrench avoids the necessity of making a collar headed setscrew to prevent the wrench from sliding over the head of the screw too far.

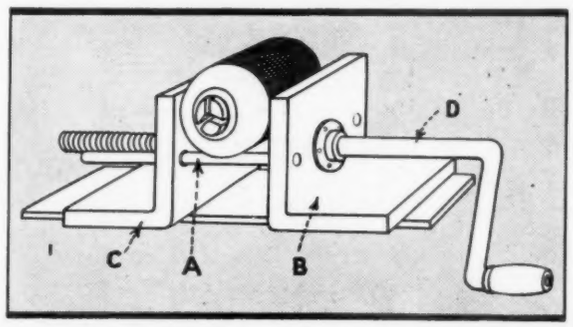


This boring bar holder has setscrew blocks to avoid the bar. Plate *B* on the wrench eliminates the necessity of making collar headed setscrews

Drill Press Vise Made From Angle Iron

By GEORGE HOLMAN

A quick-acting vise can be made from angle-iron scrap. Two pieces of angle iron are used for the jaws. Two guide pins *A* are riveted at one end to angle *B* and slide freely through holes drilled in angle *C*.



Two pieces of angle iron form the jaws for this drill press vise. The crank operates in a nut spot-welded to one jaw

Crank *D* is held to angle *B* by a collar, and screws through a nut spot-welded to angle *C*.

Turning the crank opens and closes angle *B*. Rigidity is provided by the guide pins. The chuck shown lying in the vise is resting on these pins.

Cutters Made From Toolbits

BY JOHN J. O'WRIL

A large variety of cutters can be made from old toolbits by welding them to a bar of steel which is used as an arbor. Cutters can be made in a short time and ground on a universal grinder.

If the toolbit gets too hot in the process of welding to the bar, it will anneal and a tempering operation will be necessary. This can be avoided if the weld is made rapidly and the arc is kept away from the cutting edge of the toolbit.

Generally two diametrically opposite bits are welded to the bar. Placement and grinding of these determines whether the cutter will serve as an end mill, a counterbore, or a milling cutter.

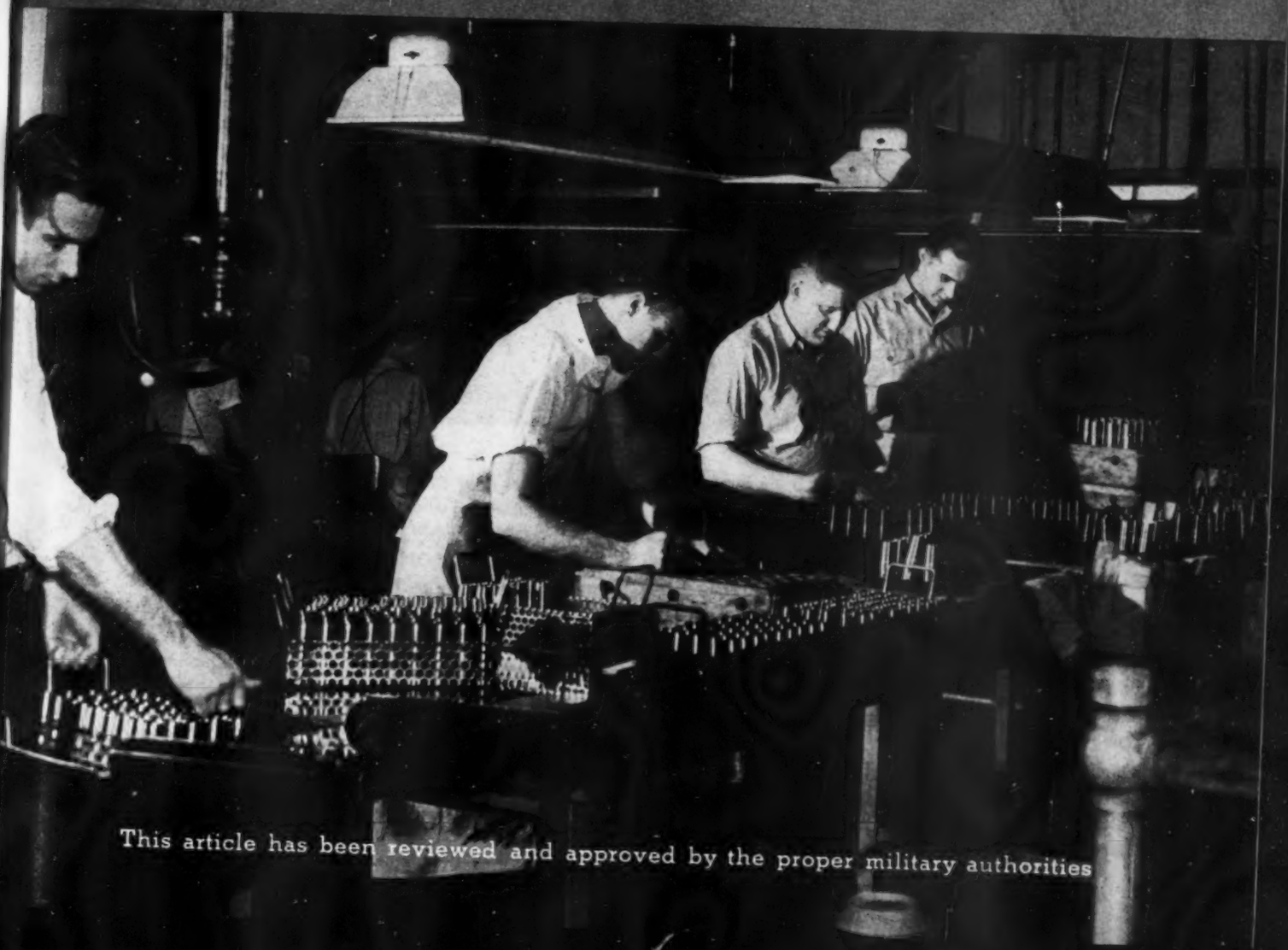
Armament

SECTION OF AMERICAN MACHINIST

Operations on 37-mm. H.E. Shell

SECOND ONLY TO machine gun and small arms ammunition in quantity requirements are the small high-explosive and armor piercing projectiles of 20-mm., 37-mm. and 40-mm. caliber, now being employed in tank and anti-tank, aircraft and anti-aircraft weapons. Manufacture of all three sizes of projectiles in mass-production quantities is essentially a matter of tooling multiple-spindle bar and chucking automatics. There are, of course, a number of operations on each of these projectiles that require other machines, and some bench work, but most of the work is done on multiple-spindle units.

One plant now converted for war production is using both New Britain-Gridley and Acme-Gridley six-spindle automatics of 1⅝-in. capacity for the first operations on the M54 high-explosive 37-mm. shell body. The projectiles are machined from 1½-in. diameter, 12-ft. long bars of WD-X1335 steel. Each machine is tooled entirely with high-speed steel cutting tools; almost all of them, except the drills, ream-



This article has been reviewed and approved by the proper military authorities

ers and taps, are made of Electrite Vanadium high-speed steel.

The sequence of operations required to produce the rough-formed shell body in the Model 61 New Britain-Gridley $1\frac{5}{8}$-in. bar machines is as follows:

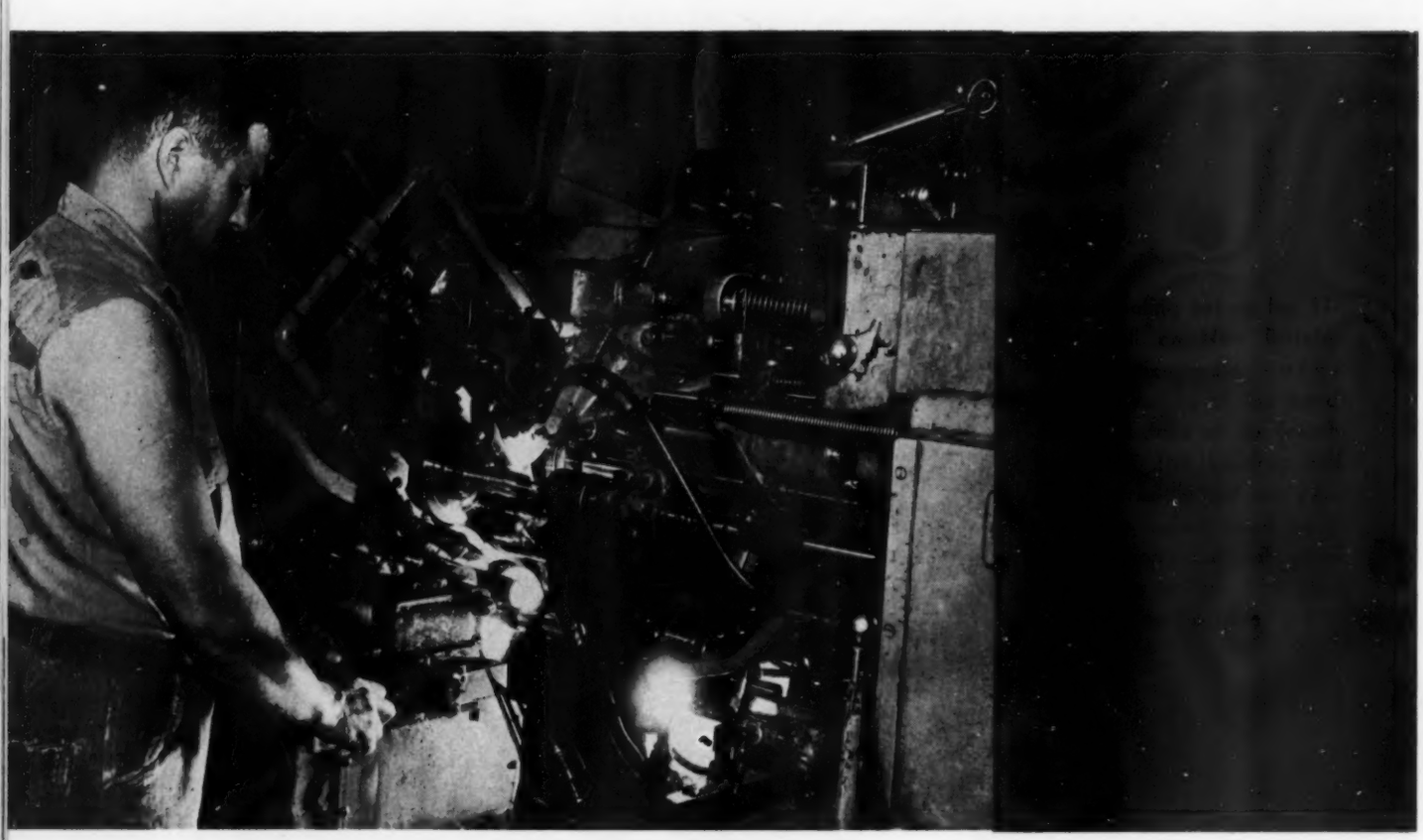
Stock is fed forward at the fifth station, after other operations at that station have been completed. Machining operations on the bar start at Station 6. Here, a $1\frac{1}{16}$-in. diameter hole is drilled 1 in. deep in the end of the bar, a circular form tool turns the ogive and bourrelet, and a dovetail form tool rough forms the band groove and the boat-tail taper. Next, at Position 1, a 1-in. drill extends the hole in the nose another 1-in. depth, leaving a stepped hole 2-in. deep.

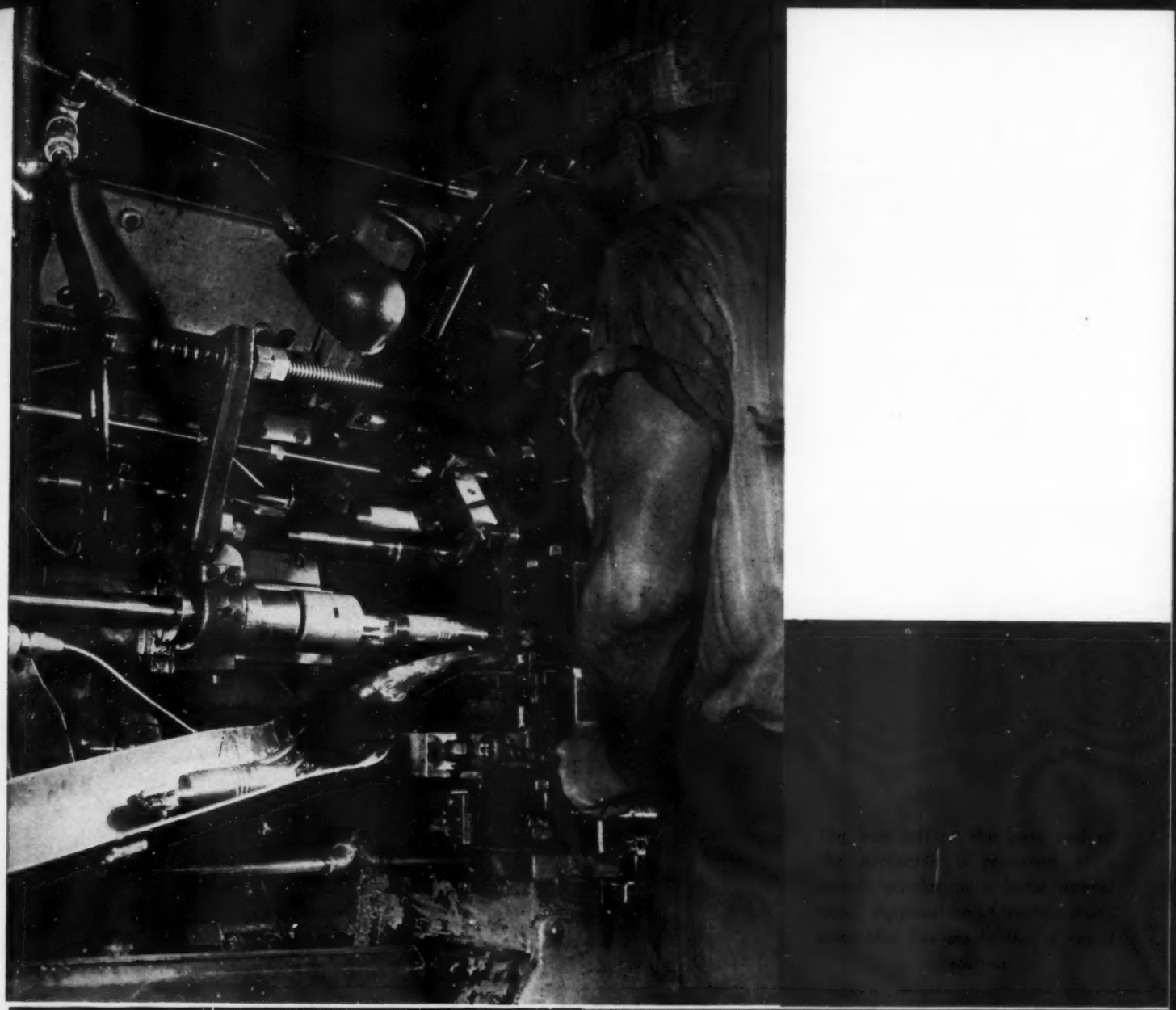
Then at Position 2 a circular form tool is employed to finish form the tapered boat-tail, the crimping groove and the cylindrical surfaces on each side of the groove and a $\frac{7}{8}$-in. drill extends the hole in the nose of the shell to a proper depth, so that the bottom of the hole will form a chamfer for the $\frac{1}{4}$ in.–28 hole drilled and tapped from the other end in a following set-up. While the above operations are being performed at Position 2, the end of the shell is rough-faced with a high-speed steel bit carried in a holder on the center slide.

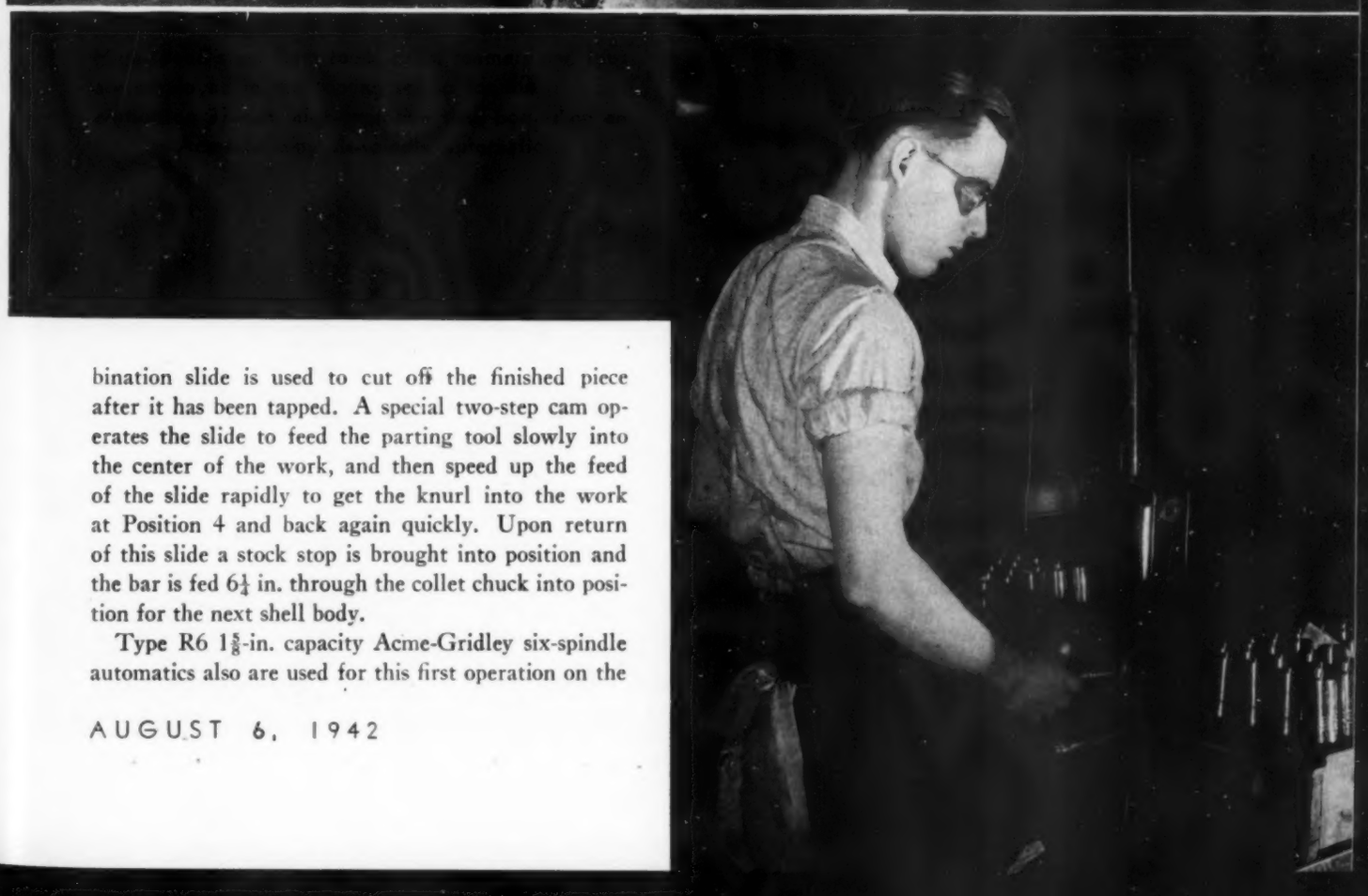
At Position 3, the tail end of the shell, including the band groove, is finished in a shaving operation, while the hole in the nose end is being rough-reamed with a $1\frac{1}{16}$-in. diameter high-speed steel drill ground with a taper so that it will leave 0.005 in. on each side and the bottom for final reaming. In this same operation, the bourrelet is turned with a high-speed steel blade carried in a box on the center slide. This blade is ground with the form of the nose end of the shell, including the ogive and bourrelet, and at the end of its cut has finished the ogive by shaving. In this operation the reamer is carried in an accelerating drive on the center slide.

At the fourth position the nose end is finish taper reamed while bits on the center slide finish face and chamfer the inside diameter for the thread. This reamer also is in an accelerater. The reaming operation is completed and the tool is returned before the knurling roll touches the work. Knurling is done at the fourth position, with a roll carried in a combination cross-slide at the fifth position. This slide carries a swivel head holding one knurling roll and a straddle roll to force the knurl into the work.

A solid $1\frac{1}{8}$ in.-20 tap in a floating, releasing tap holder is employed at Position 5 to tap the nose end to a minimum depth of 0.450 in. Also at this position, a high-speed steel parting blade carried in the com-







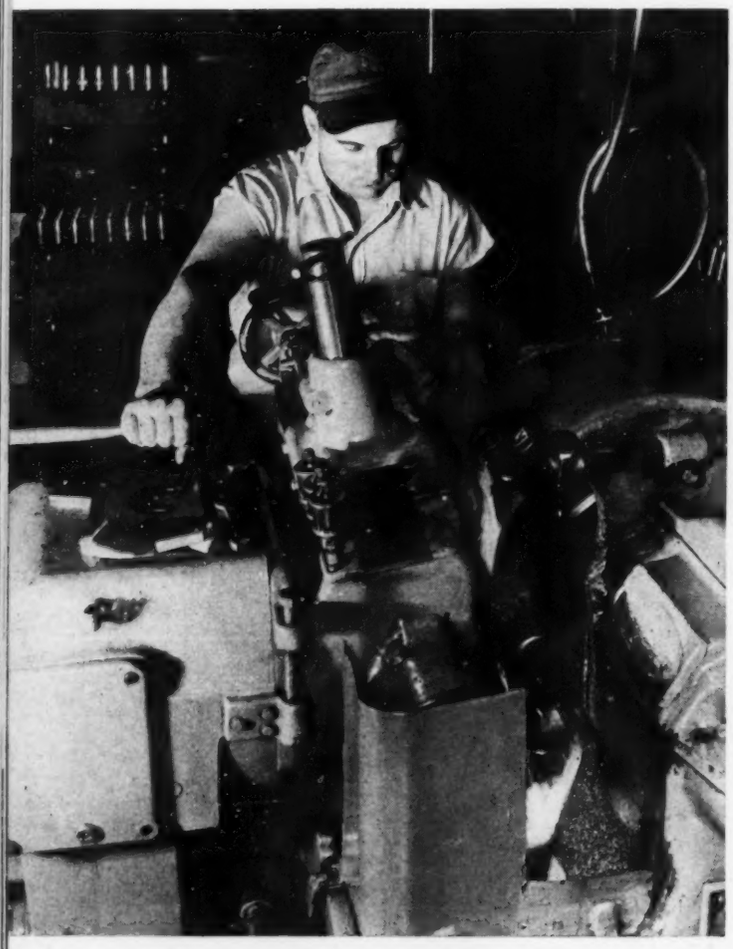
bination slide is used to cut off the finished piece after it has been tapped. A special two-step cam operates the slide to feed the parting tool slowly into the center of the work, and then speed up the feed of the slide rapidly to get the knurl into the work at Position 4 and back again quickly. Upon return of this slide a stock stop is brought into position and the bar is fed 6¼ in. through the collet chuck into position for the next shell body.

Type R6 1⅝-in. capacity Acme-Gridley six-spindle automatics also are used for this first operation on the

37-mm. projectile. However, tooling necessarily is somewhat different. As before, the work is fed in against a stop at completion of work in Station 5, then the sequence of operations is as follows:

At Position 6 the bourrelet and ogive are formed and the band groove diameter is rough-formed with high-speed steel tools, while the nose end is being drilled 1-in. deep with a $1\frac{1}{16}$-in. drill. After indexing, the band and crimping grooves and the boat-tail are finish-formed at Position 1, and a 1-in. diameter drill is fed forward to bring the hole to a depth of 2 in.

At Position 2, a box tool finish turns the ogive and bourrelet at the nose end while a $\frac{7}{8}$ in. drill is fed to depth. Next, at Position 3, the crimping groove and boat-tail are shaved and the hole is rough reamed as before. At Position 4, the projectile body is knurled in the band groove, then the hole is finish reamed. This reamer does not touch the piece until the slide carrying the knurling roll has returned from the work. Finally, at Position 5, the nose end is tapped, the piece is cut off, and stock is fed forward against a stop.



Ogive, bourrelet and cylindrical body of the 37-mm. shell body are form ground in Cincinnati centerless machines. Feed and ejection are by hand lever

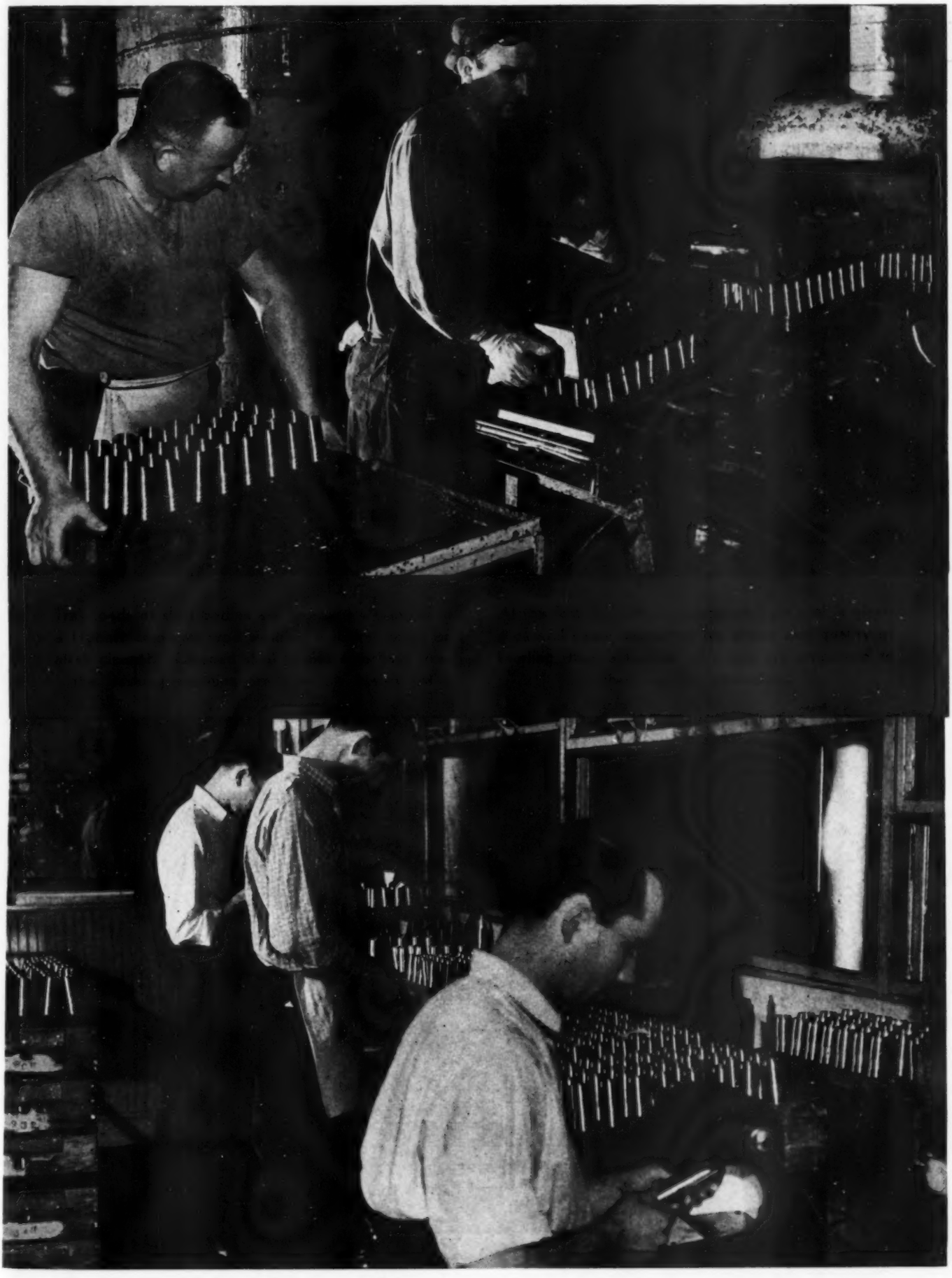
Speeds are such that the various tools are cutting at approximately 110 to 120 ft. per min. while the end tools are fed at 0.0073 in. per rev. in both makes of these six-spindle bar machines. In each machine the cut off projectile drops into a chute for delivery to a drain tray where the sulphurized cutting oil is allowed to drain into the machine base.

A preliminary inspection of these semi-finished projectiles is carried out at a bench near the bar machines to insure continued production of parts within the specified size limit, and to locate bars of poor steel in process. An occasional bar with cracks or seams is discovered, and it is removed from the machine at once. Following inspection, the shell bodies are placed base-down in holes in wooden racks, in which they are transported from operation to operation down the production line.

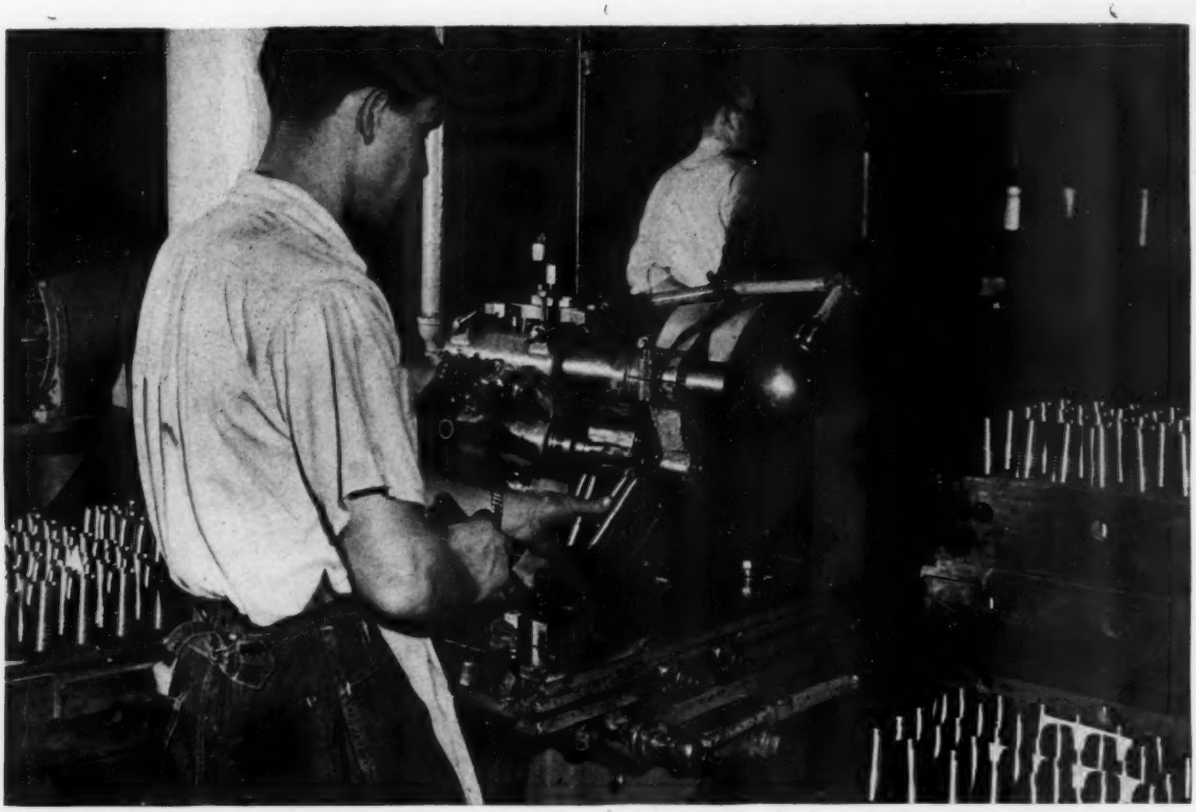
When the shell bodies are cut off by the parting tool in the six-spindle bar machine, a small burr is left at the center of the base end. This is removed in the second operation by hand grinding at a small 3,600-r.p.m., two-wheel bench grinder, of which several are placed in the production line where needed. Like all other hand operations, and all of the hand-fed machine operations in this line, principles of motion economy have been applied to such an extent that the removal of these burrs is very rapid. The operator removes a shell body from a tray at his right, passes it across the face of the wheel with his right hand, then transfers the shell to his left hand for placing in a second tray while his right hand is securing and grinding the next shell. During this operation the workman is careful to remove the burr by passing the base of the shell across the face of the wheel, rather than by pushing the shell against the face of the wheel in one position, as this would wear grooves in the wheel.

Near each bench grinder in the production line is a No. 2 Cincinnati centerless grinder where the ogive, bourrelet and body on each side of the crimping groove is finish ground at a rapid rate. A Norton 50M grinding wheel is employed, being contour dressed by a cam-controlled diamond at frequent intervals. This operation finishes the bourrelet to 1.450—0.004-in., the body to 1.440—0.008-in. diameter, and holds the diameter of the nose at the end of the ogive to 1.295—0.010 in. During this operation the workman places the shell in position on the support blade, then pushes it forward by hand lever against a stop between the two wheels. Return of the hand feed lever ejects the shell onto a chute in front of the machine. The support blade has a 0.0075-in. step, so that it will support the shell with its two diameters accurately in line with the axis of the grinding wheel. This support blade has a hard-

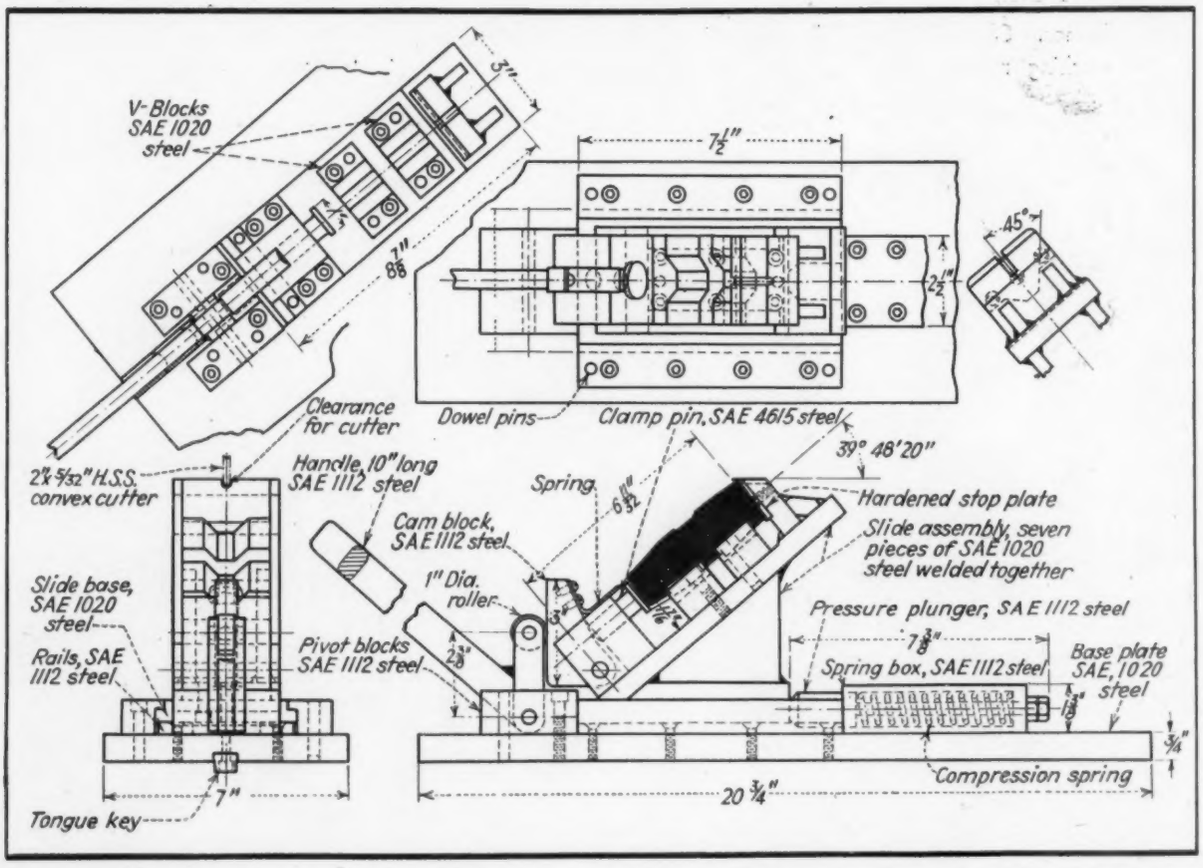
OPERATIONS ON 37-MM. H.E. SHELL



OPERATIONS ON 37-MM. H.E. SHELL

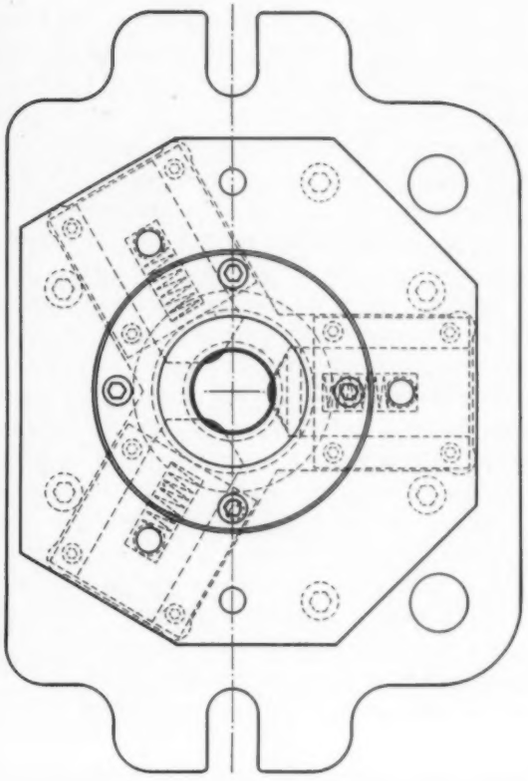


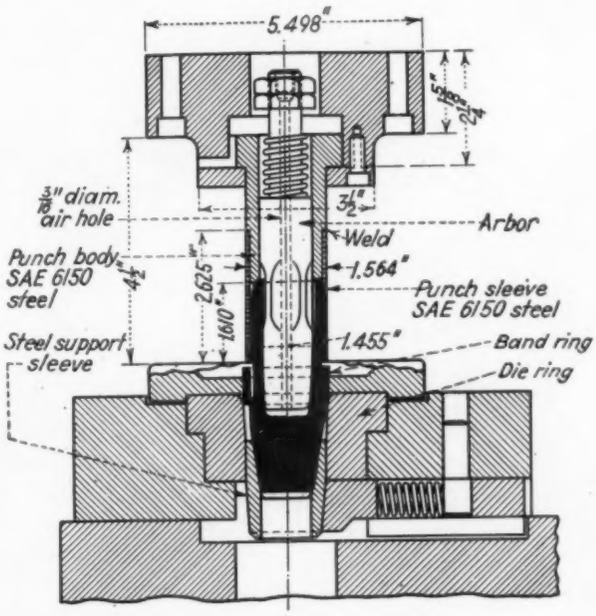
The single staking notch in the nose end of each shell body is milled in one of these small hand millers

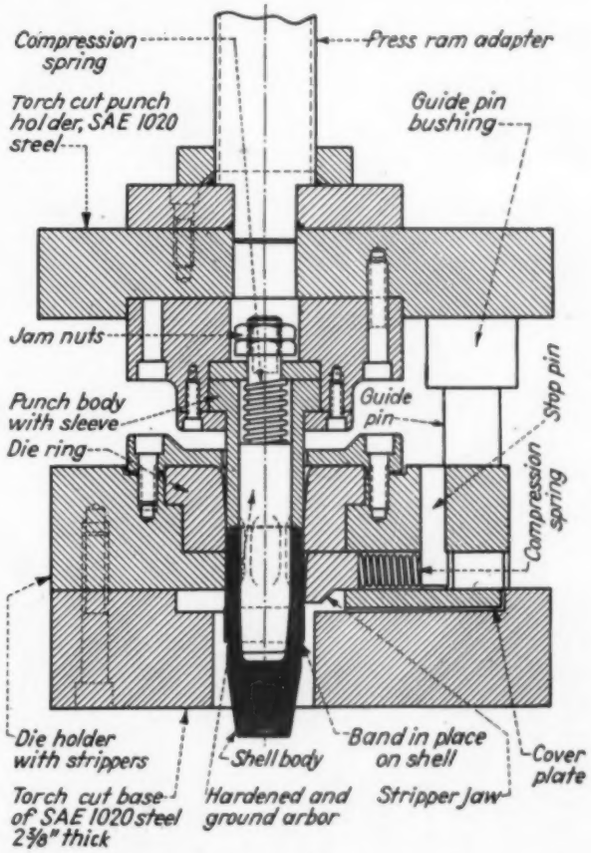


A welded fixture both clamps the work and feeds it under a 2-in. diameter, 16-tooth milling cutter when machining the staking notch. The pin forced against the tail end of the shell by the hand lever holds the piece tightly against the upper stop while the cut is in progress

Photo-electric controls on this 25-ton HPM hydraulic press help insure the operator's safety while banding 37-mm. shell







The shell body is supported inside and out while the gilding metal band is squeezed into position in the band groove with this draw die developed by Delco. The three stripping fingers strike the band end when the ram starts its return stroke, and so strip the projectile from the punch assembly

ened high-speed steel insert across the top to minimize wear, the insert being replaced as necessary.

The fourth operation in the production line handling 37-mm. high-explosive shell consists of cleaning the shell inside and out in a conveyor-type "Crescent" washer using a solution of No. 27 Solventol mixed with hot water. The machine has pressure spray nozzles above and below the conveyor, so that the shell are pressure-cleaned all over. The shell come to this washing machine in wooden trays. At the loading end, one operator removes the loaded trays from a truck to a table in front of the conveyor line, then a second operator places on top of the tray a steel rack which serves to support and locate the nose end of each shell when the tray is turned over and placed on the power-driven conveyor for transfer through the washing machine. The wood rack remains on top of each load as it passes through the machine. This turnover of each tray is necessary so that the open nose end, which is of the largest diameter, is down to permit the cleaning solution to drain away when the loads pass out of the washer. The alkali cleaning solution includes a rust preventive agent to minimize corrosion difficulties further along the production line.

At the other end of the washing machine, one operator turns the loads upside down, leaving the wood rack on the bottom, and places the steel rack on a second conveyor line which returns it to the loading end of the machine. Then, to insure that no moisture remains inside any shell, a second operator directs a spray of air from a nozzle into the open end of each shell in the rack as it passes him. A third operator removes the rack of cleaned shell from the end of the conveyor line to a waiting truck nearby.

The first operation following washing consists of a complete inspection of each shell, first under an illuminated Spectifier magnifying glass to detect any cracks or other material defects and to locate shell that may have been damaged by dropping out of the rack or some other cause. Following this careful visual inspection each shell is checked for accuracy of dimensions. All inspection gages used on these shell by shop inspectors and workmen are checked against masters by a tool inspector at least once every shift. Thread gages and others used to check the more important dimensions are inspected at more frequent intervals.

Following the first shop inspection, the shell go to a small hand-miller where one small staking notch is cut in the ogive at the nose end with a 2-in. diam-

Multichek Electrigages help ordnance inspectors keep production rolling in the final inspection group. In the set-up shown, six diameters and the over-all length of the shell are checked in one operation

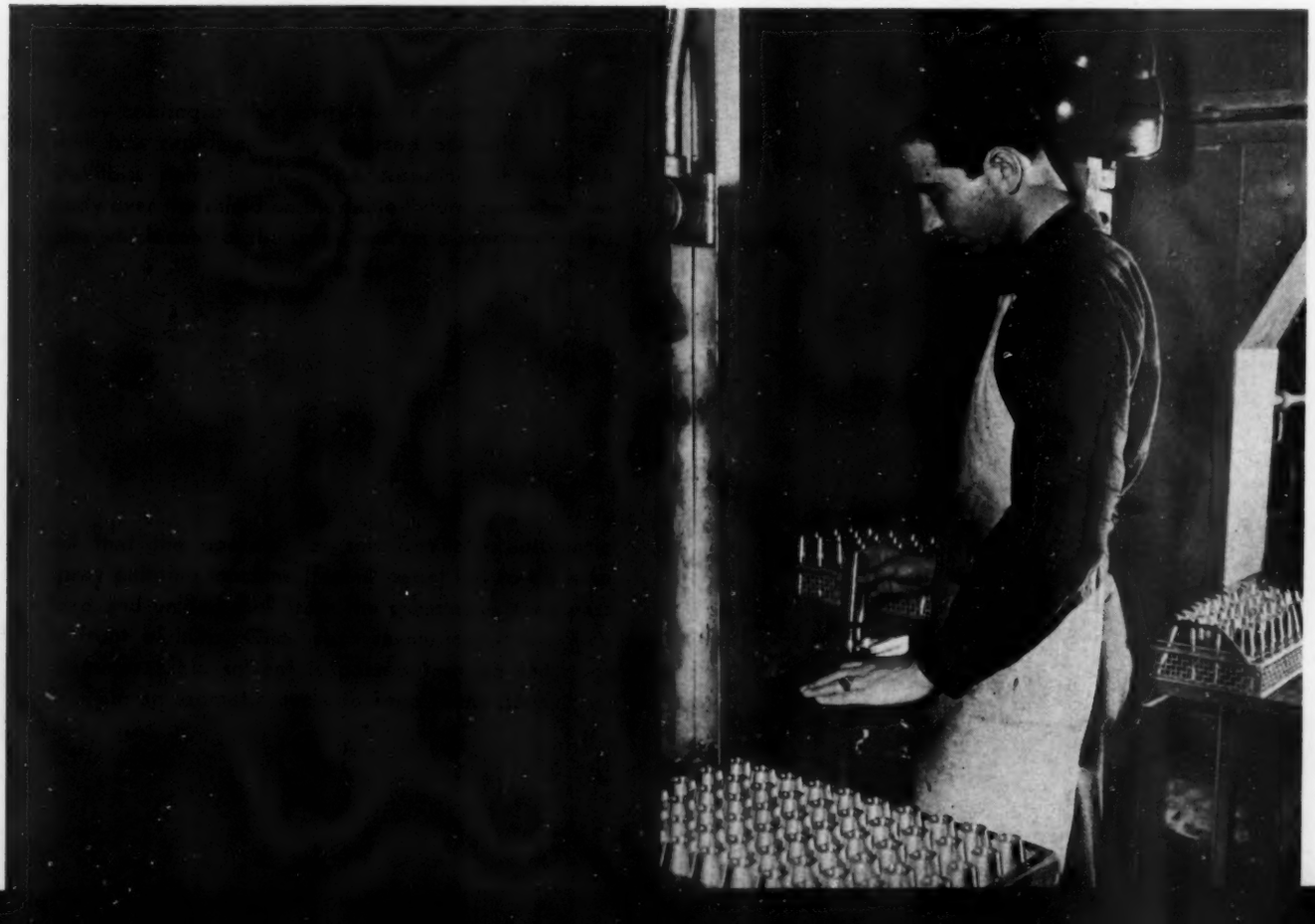
eter, 5/32-in. wide convex milling cutter in a climb cut. The quick-acting fixture developed for this operation is mounted on the table of the miller, which is tightly locked in position, and the shell is located, clamped and fed under the cutter in a quick operation by a workman who has been trained in motion economy. With the cutter operating at 500 r.p.m, only a fraction of the time required for this operation is needed for actual cutting. Each shell is laid in the V-block supports of the fixture by the operator, using his left hand. His right hand then pushes the operating lever forward to hold the shell against a stop, and at the same time move the upper section of the fixture forward to bring the work under the cutter. A spring returns the fixture slide to the outer position while the operator's right hand is removing the shell from the V-blocks to a work tray and his left hand is placing another shell in position.

Gilding metal bands are cut off from 1.681-in. outside diameter, 1.445-in. inside diameter tube stock to a length of 0.725 in. in a multiple-spindle Conomatic. Tote pan loads of these band rings and trays of shell bodies that have been notched are delivered to 25-ton hydraulic presses, each of which is equipped with a banding die set developed especially for this operation. Each press is protected with expanded-metal guards and with a photo-electric system that

The operator of this Detrex vapor-spray-vapor degreaser drops small sheet-metal shields into the threaded center portion of each shell to prepare it for the spray-painting operations which follow

insures against operation of the press if the operator's hands are not entirely outside of the danger zone.

Here, again, attention has been paid to motion economy, and the operator of each press has developed a natural swing which keeps the ram in almost constant motion. First, with his right hand, he drops into the die a steel support sleeve and a band. This support sleeve rests on the three stripper jaws inside the die to hold the ring at the proper height for compression into the band groove of the shell, which is dropped into the assembly by the operator's left hand. As he withdraws his left hand, the operator places each hand on a control switch at either side of the machine to start the ram down for its stroke of approximately 12 in. The punch assembly on the ram has a center arbor which enters the nose of the shell to support the shell body against the compression force of the banding operation. This arbor is free to move axially, being held against the bottom of the cavity by spring pressure. Around this arbor is a pressure tube of steel which bears against the band ring in the die. As the ram descends the shell body and band thus are forced through the hardened steel draw ring, and the band is compressed tightly into the groove in the shell body. As the two units drop through the bottom of the die, the operator secures the support ring with his right hand, having previously selected a new band ring from the box at his right. Thus, when his right hand emerges from under the die, he is holding on his index finger the band and support ring in proper position for dropping both into the die in one



quick motion. At the same time, the banded shell has been secured from under the die with his left hand and placed in proper position in a nearby tray, and he has secured another shell body and transported it into position. When the ram has reached its top position on the return stroke, the operator is ready to drop the three units into the die and repeat the cycle.

Base-end operations are performed and the band is finish turned on these shell in six-spindle Acme-Gridley 1⅝-in. automatic chucking machines geared for a spindle speed of 698 r.p.m., giving a cutting feed of about 270 ft. per min. on the band and about 90 ft. on the drills. The operator has only to load the shell from the trays into a magazine at the fifth position, and watch the operation of the machine to insure that all tools are cutting properly. The machine itself loads the shell bodies into the chucks as they reach the fifth position.

At Position 6, a 0.485-in. diameter hole is drilled approximately ½ in. deep in the base end of the shell, the end of the shell is rough-faced, and the band is rough turned for approximately one-half of its length. The facing and band-turning high-speed tool bits are carried by the center slide which supports the drilling head.

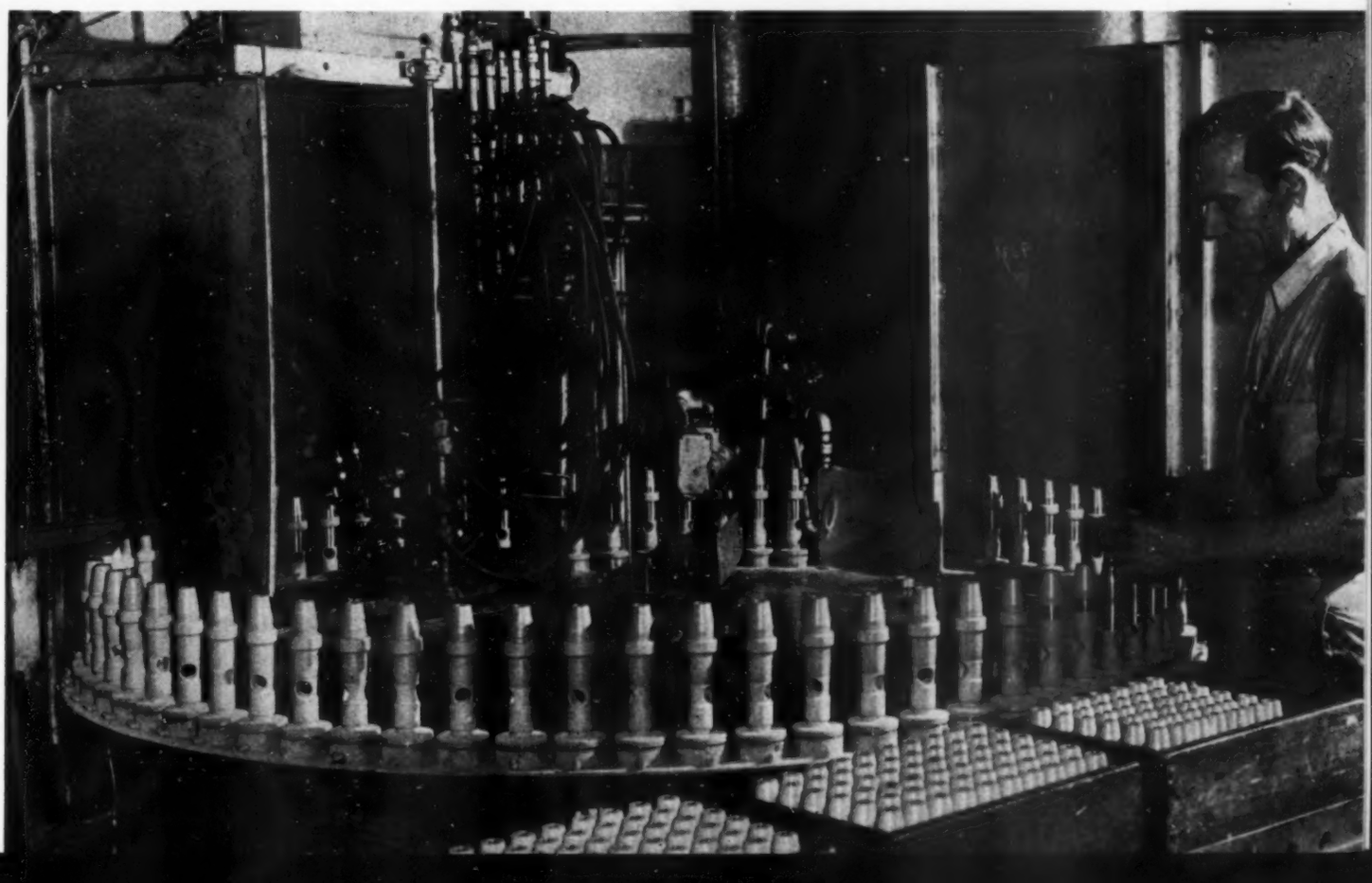
At Position 1 a step drill measuring 0.485 in. on the large diameter and 0.365 in. on the small diameter is fed in to depth, while the other half of the band groove is turned and the end of the shell is finish faced to length. Next, at Position 2, the body of the shell is drilled for a ¼ in.-28 tap, with the drill held in a two-to-one drill speeder. Meanwhile the band is finished with a form tool which chamfers the end and grooves and tapers the band.

At Position 3 the holes in the base end of the shell are finish reamed with a step reamer of 0.0501-in. and 0.370-in. diameters and the band is marked with identifying data by a stencil that is fed in on a cross-slide. This stencil roll is relieved along a portion of its circumference, so that it will make only one revolution in this operation.

The band is shaved to remove metal raised by the marking roll and the ¼ in.-28 hole in the body is tapped at Position 4, and at Position 5 the finished shell is ejected into a chute and another shell is loaded into the chuck.

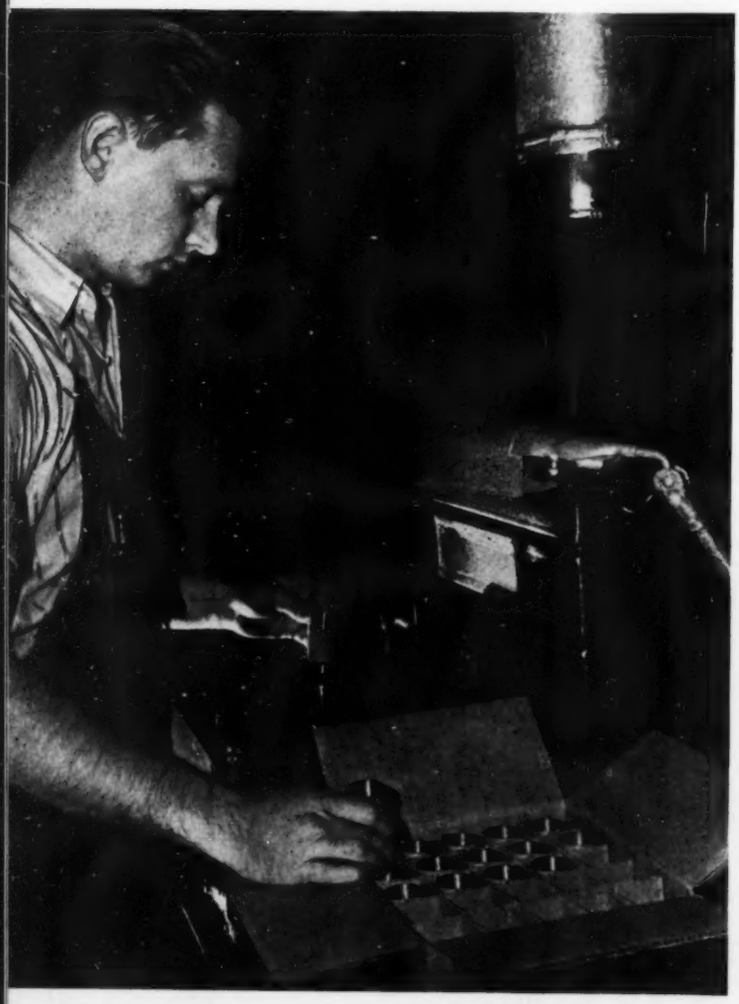
Six shell, one finished in each spindle of the machine, are checked frequently by a shop inspector working at a bench near these chucking machines. Trays of shell finished in these chucking machines go directly to the final shop inspection bench where they are transferred to expanded metal trays and dipped in an oil tank at one end of the bench. The trays then are placed on a rack to drain, the oil film remaining on the shell surfaces serving to prevent rust while the shell are in the inspection group. The final shop inspectors give each shell a 100 percent check with a number of gages, and a careful visual inspection, before it is delivered to the U. S. Army inspectors down the line.

When the Ordnance Department inspectors have checked each shell, it is properly stamped and then



placed nose-down in a wire basket. These baskets are moved by roller conveyor to a Detrex vapor-dip-vapor degreaser where the trays are transferred by hand to special hooks on the conveyor of the degreaser. This conveyor returns the cleaned shell to the same end of the machine, where the operator transfers the basket to a rack beside a nearby spray-painting booth. The operator of the degreaser drops into the base end of each shell a small tapered sheet-metal shield that remains in the $\frac{1}{4}$ in.–28 tapped hole inside the body to protect the threads during the two succeeding painting operations.

The powder cavity in the nose end of each shell is painted with a black acid-proof ammunition paint in a special DeVilbiss booth equipped with a special vertical spray nozzle. A shield set around this nozzle protects the threads in the nose end of the shell, the gun being tripped by two pins, one at each side of the shield, when the shell has been dropped into position around the shield. The operator lifts shell from the basket to the spray position with his right hand and transfers the painted shell from the nozzle to a wooden rack with his left hand, the entire cycle being so arranged that he quickly develops a natural swing that makes the operation very rapid.



Greasing of the two threaded diameters inside each shell body is an easy job with this special spray unit. Grease for the spray gun is kept fluid by electric heaters under the table

Shell Painted Two at a Time

Trays of shell next are delivered by roller conveyor to a nearby DeVilbiss automatic spray painting machine having a 6-ft. diameter rotary table. The operator of this machine handles shell two at a time as the indexing table revolves in front of him. In a rapid sequence of operations, he places two shell bodies in position on the table, transfers two band shields from previously painted shell on adjacent positions, and removes the two painted shell to another wooden tray for transfer down the production line.

Four spray guns are used in this machine. The first is a vertical gun which automatically spray paints the cavity in the boat-tail end with black acid-proof ammunition paint, the second sprays yellow ammunition lacquer on the base end, and the third and fourth guns are set in a horizontal position so that the first sprays the exterior of the shell on the boat-tail surface and body above the band shield, and the second sprays the bourrelet and ogive below the shield. At each of the four spray-painting positions the shell are revolved so that an even spray coating is applied. As the indexing table carries the shell away from the painting positions they pass an air jet which blows the small tapered shield out of the body of the shell. Five table positions on this machine are taken up by a "cleanout" shield which operates valves as it passes the spraying position to feed solvent through the four guns to clean them on a regular cycle.

Painted shell are packed in a tray for delivery by roller conveyor to a special grease spray unit. Operation of this unit is very much like that of the first spray booth, except that the spray gun installed in this unit is operated by a foot treadle in front of the operator. In this unit the grease is melted by an electric heating element and a special nozzle on the end of a DeVilbiss spray gun directs grease into the two threaded portions of the shell body as it is rotated by hand around the two-diameter nozzle. In this operation, the workman employs his left hand to lift the shell from the tray to the spray nozzle and spin it while grease is being sprayed. Meanwhile, his left hand is selecting another shell, and his right hand is in position to pick the greased shell off the nozzle and place it in a cardboard packing box at his right. A natural swing keeps this operation going at a rapid rate without fatigue.

Recommended Tap Drill Sizes—I

From National Bureau of Standards Handbook H28

THE NATIONAL BUREAU of standards Handbook H-28, entitled "Screw-Thread Standards for Federal Services —1942" was prepared by the Interdepartmental Screw Thread Committee established by the Departments of War, Navy and Commerce to promote uniformity in screw-thread standards in the departments concerned. The basis for this new handbook, issued January, 1942, is the 1933 report and preceding reports of the National Screw-Thread Commission, and Handbook H25 which superseded those reports and which this handbook supersedes, together with pertinent standards approved and promulgated by the American Standards Association. The following tables of tap drill sizes for American National coarse-thread series and American National fine-thread series of screw threads are taken from the new handbook.

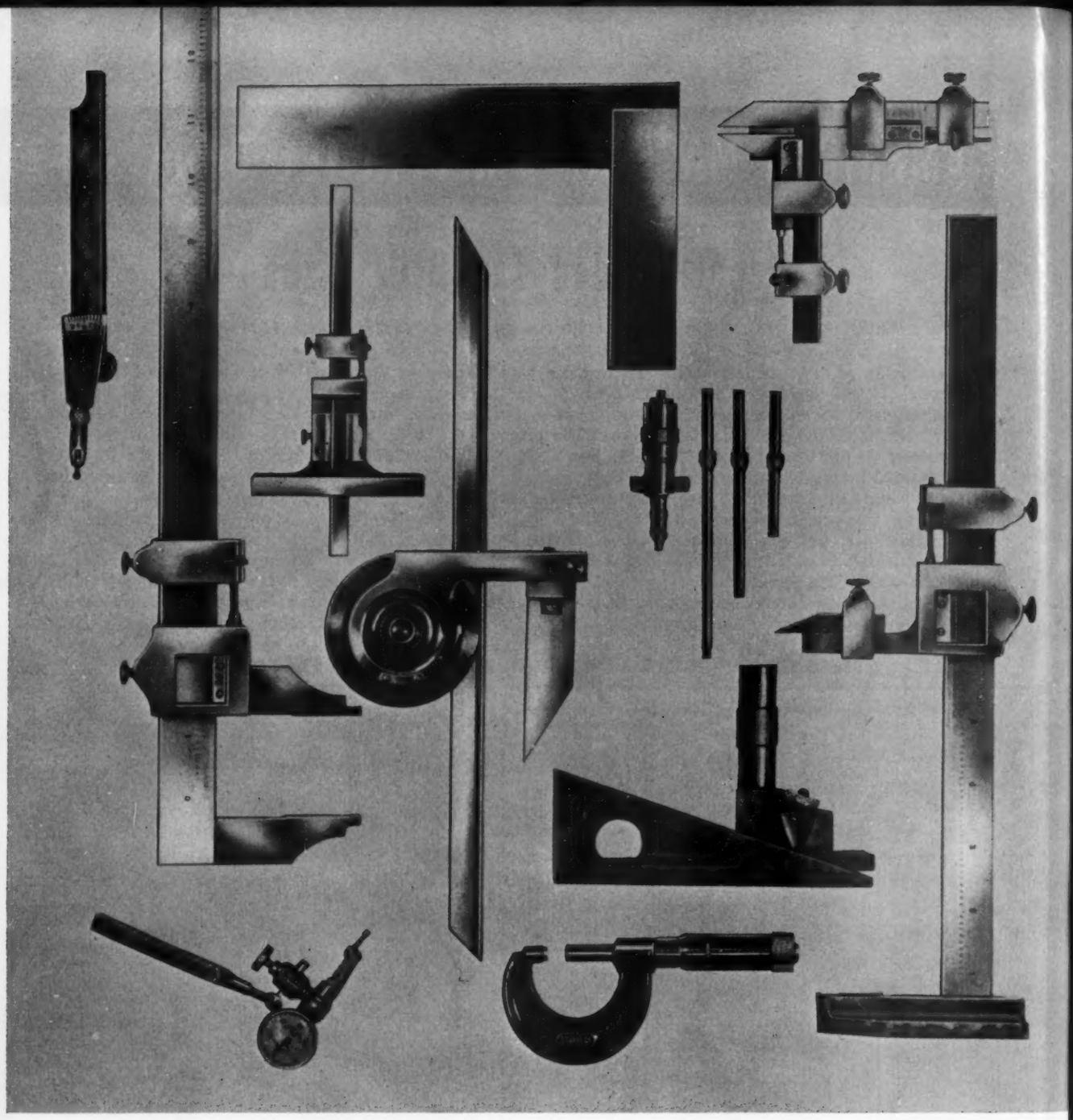
The essential requirement of a tap drill is that the hole produced by it shall be such that when tapped with a screw thread, the minor diameter of the tapped hole shall be within the specified limits. It should be noted that the minor diameters of the tapped holes are the same for Classes 1 to 4.

If the drill is too large the minor diameter of the tapped hole will also be too large and the thread in the nut will be too shallow; that is, too small a percentage of a full thread. As an extreme case the thread in the tapped hole will engage only the tops of the threads on a screw of correct size, and

SIZES OF TAP DRILLS—AMERICAN NATIONAL COARSE-THREAD SERIES

Size of thread	Threads per inch	Minor diameter of nut			Stock drills for 100 to 50 per cent of basic thread depth		
		Basic	Max.	Min.	Nominal size	Diameter	Percent of depth of basic thread
1	64	0.0527	0.0623	0.0561	*0.0531*	*0.0531*	*98*
					0.0550	*0.0550*	*89*
					0.0571	0.0571	78
					0.0591	0.0591	68
					0.0610	0.0610	59
					0.0625	*0.0625*	*52*
2	56	0.0628	0.0737	0.0667	*0.0630*	*0.0630*	*99*
					0.0650	*0.0650*	*91*
					0.0670	0.0670	82
					0.0700	0.0700	69
					0.0730	0.0730	56
3	48	0.0719	0.0841	0.0764	*0.0730*	*0.0730*	*96*
					0.0760	*0.0760*	*85*
					0.0781	0.0781	77
					0.0810	0.0810	67
					0.0827	0.0827	60
4	40	0.0795	0.0938	0.0849	*0.0810*	*0.0810*	*95*
					0.0827	*0.0827*	*90*
					0.0860	0.0860	80
					0.0890	0.0890	71
					0.0906	0.0906	66
					0.0937	0.0937	56
5	40	0.0925	0.1062	0.0979	*0.0937*	*0.0937*	*96*
					0.0960	*0.0960*	*89*
					0.0995	0.0995	79
					0.1024	0.1024	70
					0.1040	0.1040	65
					0.1065	*0.1065*	*57*
6	32	0.0974	0.1145	0.1042	*0.0995*	*0.0995*	*95*
					0.1024	*0.1024*	*88*
					0.1040	*0.1040*	*84*
					0.1065	0.1065	78
					0.1094	0.1094	70
					0.1130	0.1130	62
					0.1160	*0.1160*	*54*
8	32	0.1234	0.1384	0.1302	*0.1250*	*0.1250*	*96*
					0.1285	*0.1285*	*87*
					0.1299	*0.1299*	*84*
					0.1339	0.1339	74
					0.1360	0.1360	69
					0.1378	0.1378	65
					0.1406	*0.1406*	*58*
10	24	0.1359	0.1559	0.1449	*0.1378*	*0.1378*	*96*
					0.1406	*0.1406*	*91*
					0.1440	*0.1440*	*85*
					0.1470	0.1470	79
					0.1520	0.1520	70
					0.1562	*0.1562*	*62*
					0.1610	*0.1610*	*54*
12	24	0.1619	0.1801	0.1709	*0.1660*	*0.1660*	*92*
					0.1695	*0.1695*	*86*
					0.1719	0.1719	82
					0.1730	0.1730	79
					0.1770	0.1770	72
					0.1800	0.1800	67
					0.1850	*0.1850*	*57*
					0.1875	*0.1875*	*53*
¼	20	0.1850	0.2060	0.1959	*0.1850*	*0.1850*	*100*
					0.1875	*0.1875*	*96*
					0.1910	*0.1910*	*91*
					0.1935	*0.1935*	*87*
					0.1960	0.1960	83
					0.1990	0.1990	79
					0.2031	0.2031	72
					0.2090	*0.2090*	*63*
					0.2130	*0.2130*	*57*
5/16	18	0.2403	0.2630	0.2524	*0.2460*	*0.2460*	*92*
					0.2500	*0.2500*	*87*
					0.2520	*0.2520*	*84*
					0.2570	0.2570	77
					0.2610	0.2610	71
					0.2656	*0.2656*	*65*
					0.2720	*0.2720*	*56*

STARRETT TOOLS



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Recommended Tap Drill Sizes—II

under stress the threads of the screw will strip and the full strength of the fastening will not be developed.

If, on the other hand, the tap drill is too small, the tap will be forced to cut a thread of full depth, and in the extreme case to act as a reamer also. This will result in excessive power consumption and tap breakage and will also make the minor diameter of the tapped hole dependent upon the minor diameter of the tap. This is undesirable, since the minor diameter of the tap is not, in general, held to the same close limits as the other tap elements, and as a result the minor diameter of a hole tapped under these conditions may be in error even though the tap is otherwise correct.

It is a well-known fact that the size of the hole produced by a tap drill depends to some extent upon the method of grinding the drill, the material drilled, the lubricant used, and the speed and feed of the operation. This being true, it is apparent that fixing the diameter of the tap drill does not completely fix the diameter of the hole.

There are given in the following tables all drills regularly carried in stock, both English and metric, which fall between the limiting dimensions of the minor diameter of the threaded hole for the American National coarse- and fine-thread series, as well as drills outside of the minor diameter limits corresponding in size to thread depth from 50 to 100 percent. Drill sizes up to ½ in. are in agreement with ASA B5.12-1940, Twist Drills, Straight Shank, published by the American Society of Mechanical Engineers, 29 West 39th Street, New York, N. Y. The stock drill sizes given in italics are not within the specified limits for minor diameter of nut. All dimensions shown in the following tables are in inches unless otherwise noted.

SIZES OF TAP DRILLS—AMERICAN NATIONAL COARSE-THREAD SERIES

Size of thread	Threads per inch	Minor diameter of nut			Stock drills for 100 to 50 per cent of basic thread depth		
		Basic	Max.	Min.	Nominal size	Diameter	Percent of depth of basic thread
⅜	16	0.2933	0.3184	0.3073	*0.2969*	*0.2969*	*96*
					0.3020	*0.3020*	*90*
					0.3071	*0.3071*	*84*
					0.3125	0.3125	77
					0.3160	0.3160	73
					0.3230	*0.3230*	*64*
					0.3281	*0.3281*	*58*
					0.3320	*0.3320*	*53*
7/16	14	0.3447	0.3721	0.3602	*0.3480*	*0.3480*	*96*
					0.3543	*0.3543*	*90*
					0.3594	*0.3594*	*84*
					0.3680	0.3680	75
					0.3750	*0.3750*	*67*
					0.3860	*0.3860*	*56*
					0.3906	*0.3906*	*51*
½	13	0.4001	0.4290	0.4167	*0.4062*	*0.4062*	*94*
					0.4219	0.4219	78
					0.4375	*0.4375*	*63*
9/16	12	0.4542	0.4850	0.4723	*0.4687*	*0.4687*	*87*
					0.4844	0.4844	72
					0.5000	*0.5000*	*58*
					0.5062	*0.5062*	*52*
5/8	11	0.5069	0.5397	0.5266	*13 mm*	*0.5118*	*96*
					33/64	*0.5156*	*93*
					17/32	0.5312	79
					13.5 mm	0.5315	79
					35/64	*0.5469*	*66*
					14 mm	*0.5512*	*62*
					9/16	*0.5625*	*53*
¾	10	0.6201	0.6553	0.6417	*5/8*	*0.6250*	*96*
					16 mm	*0.6299*	*92*
					41/64	*0.6406*	*84*
					16.5 mm	0.6496	77
					21/32	*0.6562*	*72*
					17 mm	*0.6593*	*62*
					43/64	*0.6719*	*60*
⅞	9	0.7307	0.7689	0.7547	*47/64*	*0.7344*	*97*
					19 mm	*0.7480*	*88*
					3/4	*0.7500*	*87*
					49/64	0.7656	76
					19.5 mm	0.7677	74
					25/32	*0.7812*	*65*
					20 mm	*0.7874*	*61*
					51/64	*0.7969*	*54*
1	8	0.8376	0.8795	0.8647	*27/32*	*0.8438*	*96*
					21.5 mm	*0.8465*	*95*
					55/64	*0.8594*	*87*
					22 mm	0.8661	82
					7/8	*0.8750*	*77*
					22.5 mm	*0.8858*	*70*
					57/64	*0.8906*	*67*
					23 mm	*0.9055*	*58*
					29/32	*0.9062*	*58*
1⅛	7	0.9394	0.9858	0.9704	*24 mm*	*0.9449*	*97*
					61/64	*0.9531*	*93*
					24.5 mm	*0.9646*	*86*
					31/32	*0.9688*	*84*
					25 mm	0.9842	76
					63/64	0.9844	76
					1	*1.0000*	*67*
					25.5 mm	*1.0039*	*65*
					1 1/64	*1.0156*	*59*
					26 mm	*1.0236*	*55*
					1 1/32	*1.0312*	*51*
1¼	7	1.0644	1.1108	1.0954	*1 5/64*	*1.0781*	*93*
					27.5 mm	*1.0827*	*90*
					1 3/32	*1.0938*	*84*
					28 mm	1.1024	80
					1 7/64	1.1094	76
					28.5 mm	*1.1220*	*69*
					1 1/8	*1.1250*	*67*
					1 9/64	*1.1406*	*59*
					29 mm	*1.1417*	*58*
					1 5/32	*1.1562*	*51*

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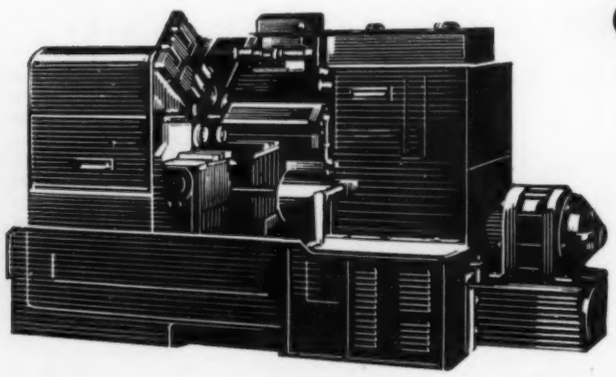
The rate of output of New Britain Automatics is, of course, confidential . . . We can promise those who have machines on order that nothing has been left undone to meet the tremendous wartime demand for these essential machines.

★ ★ ★



● NEW BRITAIN AUTOMATICS

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MACHINE DIVISION • THE NEW BRITAIN MACHINE CO. • NEW BRITAIN, CONN.

WAR BONDS ARE ANOTHER VITAL WEAPON FOR VICTORY . . . YOU CAN'T BUY TOO MANY

A Stitch in Time

EVERY AUTOMOBILE owner is keenly alive to the fact that he must keep his car in good condition, use it wisely and drive cautiously. He must make it last for the duration. As the safety people say, "Drive carefully, brother, you can't get another."

What is true on the highway is likewise true in the military field. With weapons for our own men and for our allies going to the far corners of the earth, where replacements are dependent upon long lines of transport, the military forces must employ them effectively and maintain them in the best possible condition.

One of the reported advantages of Marshal Rommel in northern Africa has been the ability of his men to keep combat weapons in good shape and to repair them and return them to action quickly, when damaged.

We are glad to note that the Ordnance Department of our own Army intends to stress the importance of preventive maintenance. Soldiers are to be taught to maintain their weapons in the best possible condition at all times. Special groups are being formed to service combat weapons in the field. Mass production must be supplemented by expert and continuous use of the fighting equipment turned out.

Preventive maintenance should reach back from the battle lines to the war production factories. With plants operating round the clock and wear and tear on machinery at a peak, the need for good maintenance is imperative.

Every machine that is down results in lost production. If it happens to be a "bottleneck" machine, it may mean a serious dislocation of manufacture.

No preventive maintenance program would be complete unless it included the men in the shop. It is necessary to keep war workers on the job if production schedules are to be met. Last year more time was lost through accidents in American industry than because of strikes.

Today more than ever before we must guard our manpower and see that it is kept functioning continuously and effectively. That is especially true as millions of men come into industry for the first time and take their places at the machines with only a few weeks of training. They must be taught to work safely and to maintain their machines properly.

In our war upon the Axis, preventive maintenance plays a vital part, whether it be on the sands of Libya or on the floor of a mid-western munitions factory.

Burnham Finney

GAGING BUSINESS

Enough fabricating capacity exists to absorb more raw materials than can be supplied. June machine tool output up. Plan to concentrate steel production by types

The big pinch in war production is in materials. Shortages have reached the critical stage. They are so severe that they are limiting war operations in many lines, and the situation will get worse before it gets better.

In general the country has more than enough fabricating capacity to absorb all of the materials available, and more. The decision has to be made as to who will receive materials and who will not. Reduction in manufacturing inventories of raw materials appears certain to be forced by government direction, because of critical shortages.

Over the Hump—War officials foresee the time, probably by early 1943, when all the machine tool productive capacity now devoted to make machine tools will not be needed for that purpose. A certain portion of it will be diverted to manufacturing war products which individual builders are best suited to make.

This is not to say that every machine tool company will be faced with this problem. Orders ahead for machine tools still are of unprecedented size, being over a billion dollars, and many builders will have their hands full producing all of their particular kinds of tools wanted for the war effort.

No Severe Drop—There is no likelihood of any immediate severe drop in machine tool demand. But signs are increasing that it will fall off somewhat from its present $1,300,000,000-a-year proportions before many months have passed. The volume still will be high and doubtless will be on a big scale as long as the war lasts.

It is only fair to say that some Washington officials continue to cling to the opinion that no diminution in machine tool demand or output will occur so long as the war lasts. They feel that new production programs constantly will be coming to the front, programs that cannot now be foreseen, but which will develop as the course of war shifts. This opinion appears to be in the minority.

To Pull Back Work—If and when the anticipated contraction comes in machine tool orders, the War Production Board will favor machine tool builders pulling back work into their own plants from subcontractors' shops before curtailing their own operations. Wherever a machine tool company has idle capacity and can adapt itself to the manufacture of critical machines produced by another company, it will be asked to help out on a subcontracting basis. Some companies are now doing this. No machine tool builder, however, will be permitted to take on any munitions manufacture without the consent of the tool branch of WPB. For the moment at least, it is the final authority on this point.

June Output—The value of new machine tools, presses and other metal-working machinery shipped during June was $122,700,000 according to the War Production Board. Shipments of machine tools alone amounted to 26,600 units with a total value of $111,147,000. During May, 25,700 units, valued at $107,300,000 were shipped. Production of metal-working machinery has now reached an annual rate in excess of $1,470,000,000 and is still steadily increasing. Last year's total production was valued at $840,000,000.

Production for the first six months of 1942 of machine tools, presses and other metal-working machinery was valued at $649,800,000, an advance of 98 percent over the like period of 1941. It equalled 77 percent of last year's total output.

To Get More Steel—The government has devised a plan for getting more steel for the war production effort. Each steel mill is to concentrate manufacture on the product which it can turn out best in the largest quantities. No longer will each company make what it pleases, with its products overlapping those of other companies. The attempt will be made to allot steel production so that the total tonnage produced will take care of all war requirements. So much attention has been centered on plates recently that plate production has expanded sharply at the expense of other important items, including sheets.

The operating rate of steel companies that have 91 percent of the steel capacity of the industry was 97 percent of capacity last week. This represents a decline of 1.7 percent from the previous week. This operating rate is equivalent to a production of 1,647,700 tons of steel ingots and castings for the week.

The national salvage program has set a goal for collections of scrap iron and steel for the last six months of this year of 17 million tons. At present there are about three million tons of scrap iron and steel on hand, or about one month's supply at current production rates. During the first half of 1942 the industry consumed 13,700,000 tons. It is expected, however, that 17 million tons is the minimum amount necessary to keep furnaces charged to capacity and to provide sufficient stock piles for full-time operations throughout the winter months.

Munitions—The amount of munitions of all kinds made in June was almost three times as large as in November, the month before Pearl Harbor. In the first six months of this year as much munitions was produced in this country as in the entire year of 1941. During the same period many more tanks were built than during all of last year. The proportion of M-4 tanks, with rivetless hull and a 75-mm. gun mounted in a center turret, is constantly increasing.

Artillery and anti-tank guns are being made at a rate of about 2,000 a month. Machine gun production totals over 50,000 units a month. Sub-machine guns are being produced at a rate better than 55,000 a month.

Job Placements—The United States Employment Service placed nearly a million men in June, as the rate increased sharply for the fourth successive month. More than 644,000 jobs in factories, shipyards, and offices were filled—43 percent more than in June, 1941 and double the number filled by public employment offices in June, 1940. The USES received 1,100,000 new applications during June, an increase of 25 percent over May.

War Costs—Past appropriations and proposed appropriations bring the total war cost to approximately $223 billion. Expenditures in June were $4,123,000,000 as compared with $3,880,000,000 in May. Contracts let in May amounted to $9,731,000,000.

Wages and Living Cost—Warning manufacturers against making wage increases which might violate the War Labor Board formula laid down in the "Little Steel" Decision, the National Association of Manufacturers reports that more than two-thirds of the nation's manufacturing industries have already met or exceeded by wage increases the 15 percent increase in living costs since January, 1941.

Industry Concentration—Further concentration of civilian industry in designated plants appears likely. Donald Nelson cites three conditions which are likely to lead to such a step for a particular industry: 1. Some or all firms in the industry are needed for war production and can be converted to such production. 2. Permitted civilian production is so restricted that economic operation of all firms in the industry is not possible. 3. A significant part of the production is continuing in areas where there are bottlenecks in labor, transport, power or warehouse facilities.

Plans for Federal Controls Over Labor Supply

Australia Prepares—These castings for trench mortar shell are awaiting loading somewhere in Australia

Bigger drains on manpower than ever made in last war may mean manpower allocation. Full control is unlikely but every step taken from now on will be in that direction

BY ROBERT COLBORN

WASHINGTON—Industry is pretty well used by now to the idea of having materials and machinery allocated. Only beginning is the allocation of manpower. Whether the government will ever come to the point where it tells every person what job he should be doing and where is a question that depends on how far we are able to expand war production, what demands the military progress of the war makes on manpower. But don't dismiss the possibility entirely. Already the war industries are employing some 12 million men, recruiting more at a million-a-month rate. Size of the Army is rising toward 4,500,000 or more at the end of the year, six to eight million in 1943.

These are bigger drains on manpower than were ever made in the last war; we'll have to go farther than we did then. So far, the only efforts toward manpower control are summed up in the system of occupational deferments from the draft and the policy by which the U. S. Employment Service gives first attention to the needs of war industries.

Full allocation of manpower won't come this month or next, but every step taken by the War Manpower Commission from now on will be in that direction.

Probable WMC Steps

These are the steps in the immediate offing.

Imposition within the next few weeks of federal controls over labor-raiding in critical areas.

Expansion of these controls into a primitive system of labor priorities.

Development of a more scientific system of occupational deferment from the draft.

Elimination of voluntary enlistment into the Army and Navy of draft-age men.

Preparation of a National Service Act to provide the legal foundation for totalitarian manpower allocation. This is now being written but is unlikely to come before Congress until after election.

Paul McNutt's policy on war contractors' stealing men from each other makes the usual bow to voluntary methods. Labor and management groups in war-production centers are being encouraged to get together and promise to be good boys. Agreements are being worked out by which each employer promises that before hiring a man now working in a war industry he'll get the consent of the present employer.

In the really critical areas, it's not expected that the scheme will stay voluntary long. A half dozen or so areas have already been picked which will be declared "critical labor areas" as soon as McNutt can get his field organization set up.

Draft deferment policy is a closely related problem from the point of view of the employer. Since the early months of the war, when occupational deferments were restricted to essential industries, there has been no important changes in the procedure of occupational deferment.

Possibility of a completely different approach is now being thrashed out within the Manpower Commission. Instead of treating the matter entirely in terms of individuals, this would start by considering a plant or company as a whole. It would call for a careful analysis of the manpower problems of an individual firm. From this pattern could be worked out of what personnel must be retained.

Little Steel Decision May Set National Wage Policy

WASHINGTON—All indications, as of early August, point to adoption of the policy on wages set forth in the War Labor Board's Little Steel decision as the basic national policy—for awhile at least. When it gave the steel workers an extra 44 cents a day, WLB said it thought wages in general should be permitted to rise above their January, 1941, levels as much as the cost of living rose from that date to May 29, 1942—about 15 percent. That last was when the President made his anti-inflation speech in which he said wages should not go up any more.

In the Remington-Rand decision late last month the WLB again applied the same policy, denying a wage increase on the grounds that wages had already risen 15 percent above early 1941.

This is not a policy which labor welcomes. The labor members of WLB have consistently voted against it. Both AFL and CIO are promoting an alternative policy under which they would agree to take future wage increases in special war bonds not cashable until after the war but would be allowed to continue to get wage increases—thus staking out a claim to a large share of the national income after the war is over.

Immediately after the Little steel decision it looked as if the CIO might really get tough over it. But any such impulse was squashed when the President hinted he might ask congress for wage-freezing legislation. One worry is the possibility of a growing number of wildcat strikes if a degree of wage freezing should arouse more discontent among the rank and file than union leadership could or would control.

Critical Tool Service Is Locating Idle Tool Hours

WASHINGTON—Back in March the War Production Board and the Army-Navy Munitions Board jointly set up a Critical Tool Service, whose function is to locate idle machine tool hours and search out jobs to absorb them.

CTS has made little noise and considerable progress, and last week was able to report that there were available, per week, in major industrial areas, 2,295,049 hours on a list of 55 critical tools. That was the amount of hours remaining after 4,903,386 hours of work had been placed among 1,669 companies having previously reported idle time.

These figures are based on a 168-hour week; the 55 critical tools includes various sizes as well as various types.

CTS works in close cooperation with the Tools Branch of WPB. Less than a dozen persons under the direction of B. T. Bonnot, chief of WPB's facilities service section, are doing the job in Washington.

This service is set up on a WPB regional basis with 13 divisions. Boston, New York, Philadelphia, Cleveland, Chicago, Kansas City, Minneapolis, Denver and Dallas are functioning fully. Detroit Seattle, San Francisco and Atlanta have yet to be organized.

Using Mass Training for Workers, Russia Increases Labor Productivity 65 Percent

LONDON—One of the vital conditions for fulfilling the third Five-year Plan in the U.S.S.R. is the training of skilled workers and engineers as well as the widespread adoption of the most up-to-date technique and scientific organization of production. During this period the productivity of labor in the industries of Soviet Russia has increased by 65 percent. The system of courses for training and requalifying skilled workers and master craftsmen is continually being expanded. More than 8 million skilled workers of various trades are now being trained. A total of 1,400,000 technicians and 600,000 engineers and other highly skilled experts have graduated during the past five years.

Three-fourths of all the machine tools in the Soviet Union are less than ten years old. Because they are new types with which the majority of workers are unfamiliar, the old workers have had to be taught anew while provision had to be made for training a great number of young people in the operation of this new equipment.

Factory Trade Schools

Factory trade schools have been introduced in which the pupils receive a general education equal to that provided in high schools. These schools are furnished with special workrooms, classrooms and experimental laboratories. Practice work is done right in the factories. Young people are granted state allowances for the entire period of their attendance at the training schools, and on graduation each student is placed in a job suited to his training. Six new mass technical training schools are at present under construction in the Donetz Basin.

The Soviet Union wholeheartedly supports the Stakhanov movement which was begun in 1933 and spread to all branches of industry. Stakhanovites are workers who have completely mastered the technique of their jobs and who are imbued with the ambition to help increase labor efficiency on a national scale. The government has still further extended the technical education of the worker masses by setting up Stakhanovite courses for those who have passed the state technical minimum examinations. In the fall of 1941 there were 218 Stakhanovite courses given in the Stalingrad Tractor Works which were attended by 3,300 workers, and in the Molotov Automobile Works there are about 40 such courses.

ENGLAND'S WPB REORGANIZED

LONDON—The machine tool capacity of industry is the subject of special measures for greater efficiency in war production. Regional production boards in England are to be reorganized, and new regional controllers of production will be appointed. Until the new appointments are made the present members will continue in office, although they have formally resigned. It is expected that one result will be an increase in capacity exchanges. There is still a wide dispersal of machine tool capacity in small quantities that may offer opportunity for concentration. The output of the machine tool industry itself is not mentioned as coming within the scope of the new drive, which implies that the immediate problem does not involve the supply of machine tools.

Headway Is Made in Scrap Campaign in Chicago Area

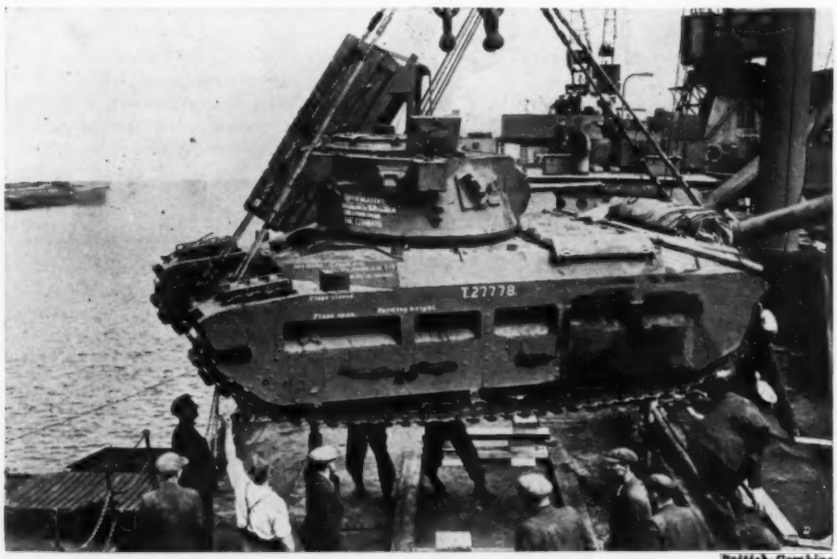
CHICAGO—Steel manufacturers desiring scrap to reduce the amount of carbon in the mix for their ingots say they need at least 30 million tons of iron and steel scrap. Notwithstanding the industrial salvage campaign conducted since last winter, the steel mills will be 4,500,000 tons short of needed scrap unless many more plants join in gigantic efforts to get it in. Next to that of steel the reclamation of aluminum scrap is regarded of most importance.

For the last nine months D. W. Gee has been a leader in the Industrial Scrap Campaign of the Bureau of Industrial Conservation of the WPB Division of Industry Operations, spending most of the time in the Chicago region. Until the middle of June the region comprised fourteen states but in the recent WPB decentralization of this region the territory covered in this campaign has been cut down to four states: Illinois, Indiana, Wisconsin and Iowa. Mr. Gee has been given enlarged duties of chief technical advisor of the Industrial Salvage Section of the Bureau of Industrial Conservation, carrying on from Chicago in all the regions of the middle section of the country.

Plant Directors Appointed

Appointment of a total of 14,076 salvage directors, or managers, was secured in as many plants. The appeal for action has been on a voluntary basis and reports have been turned in to the Bureau on a simple form semi-monthly. The first step in securing the interest of plants in the salvage program has been to enlist the assistance of an association for a state or industrial district in calling a general meeting at which the program was explained and executive committees formed. Such committees are functioning in 100 communities in fourteen states. In many companies where good scrap salvage programs have existed, recovery has been greatly increased by appointing a salvage manager.

Mr. Gee insists on the segregation of different kinds of scrap and worked up and used for many years, while chief of the Reclaimed Materials Division of Western Electric Company, a decimal classification system comprising fourteen main groups and 254 classes in all. He believes that the salvage manager should be an older employee, familiar with all departments of the plant and its manufacturing methods.



Off to Russia—This British-built "Matilda" tank being shipped from an English port is beginning the first leg of its long journey to the Eastern front. This is reported to be a daily scene in this port where ships are loaded with war goods before leaving for the arctic ports of the Soviet Union

Demand for Expanded Cargo Plane Program

Aviation authorities believe that cargo aircraft will haul more freight than same investment in ships. A substantial program is already under way, expansion now held doubtful

WASHINGTON—Demands by shipbuilders A. J. Higgins and H. J. Kaiser for contracts to build big cargo planes are merely current symptoms of a deep and increasing sense, both lay and expert, that war supplies and troops could and should be flown above the reach of submarines, and at 200 miles per hour instead of ten on the surface.

You can hardly find an aviation authority any more who does not believe that a given investment of time and metal in cargo aircraft will haul more freight between two points than the same investment in shipping. The reason, of course, is multiple trips by the plane to one by the ship. Add to that the practical elimination of losses by enemy attack, and you have a proposition that might well turn the tide of world war.

Potentialities Obvious

Potentialities of air cargo have been obvious to a few aviation men for years. Present general agreement in favor seems to be several years too late. It is not now a question whether the 5000 flying vessels proposed by Kaiser would be practical and desirable. The question is whether we can afford to sacrifice time and material needed on other production, to make the planes.

Nelson said ". . . men, machines, facilities and materials could not be made readily available for any new cargo plane program, beyond the program now under way, except at the expense of other parts of the war effort."

He also explained that many considerations of strategy are involved and any decision must be made in close consonance with the highest strategy officials of the United Nations.

In other words, whether to take metal and man hours away from tanks, or shells, or war ships, or even merchant ships, to lift a substantial portion of oversea traffic into high speed and safety perhaps two years from now, is a question that is engaging the attention of the United Nations' head men right now.

Higgin's Chances Poor

We might be seriously set back in the war for lack of materials and energy given to cargo planes, or we might gain great advantages by having the planes three years from now. It is a weighty decision to make.

Turning from the general picture to the specific proposals of Higgins and Kaiser, disinterested opinion is that these two men, though their abilities are highly regarded everywhere, are simply not in the know about airplanes. Actually, there is hardly any equipment, tools, facilities in a shipyard of any use in building airplanes. And Mr. Higgins doesn't even have a shipyard; he was just building one when his contract for 200 Liberty vessels was cancelled.

Use Existing Firms

If WPB, Army, Navy and the United Nations' representatives did decide to sacrifice something else and build the airplanes, people like Glenn Martin, Curtiss, Douglas, Boeing—would have to furnish the know-how men and somebody would have to build new plants. There would seem to be no point in giving the contracts to Higgins or Kaiser. If the Administration wants to make use of their bold imaginations and forehandedness in connection with aircraft, there is no reason why not.

But if you feel strongly pro-cargoplane, don't feel beaten if Higgins and Kaiser get turned down. We *have* a formidable air cargo program under way. Orders for hundreds of planes will be made good this year. Our domestic air transport system is now being expanded, under Brig. Gen. Harold L. George, head of the Army's Air Transport Command, to reach all the Allied industrial regions in the world. The airlines will start taking delivery on large numbers of new planes in August.

Further Development Needed

For next year, and in 1944, orders already placed for cargo planes run into thousands. These orders are for commercial planes already proved in service. Specifically, we have eight: four four-engined planes: Boeing stratoliner, Douglas C-54, Lockhead Constellation, Sikorsky Excaliber. Douglas has completed the engineering of a fifth four-engined plane, a 140,000 pounder, which is the same size as the B-19 bomber.

In the two-engined class are the new Curtiss plywood C-76, Curtiss C-46, Douglas DC-3 (C-47 in a cargo version), and the Lockheed Lodestar.

Opinion seems to be that we should put all the material and time we can spare on further development of the existing program. Meanwhile, at the end of about two years, engineering will have been completed on some really big planes, like Martin's 125-ton six-engined boat, and a still bigger one whose designer cannot be named.

Hand Miller — Lockheed Aircraft Corp. developed this high speed miller, worked by hand, to rapidly face off surface of P-38 wing fitting. It uses an air-driven Onsrud motor

HITLER'S SCRAP DRIVE

BERLIN—(Domestic broadcast heard by U. S. Government Listening Post)—Hitler has ordered the confiscation of all unused iron and steel in Germany, including finished castings and spare parts. The campaign will be enforced by the uniformed police under Heinrich Himmler, Gestapo Chief. Factory managers who fail to comply with the new decree will "fall under penal stipulations of the order of the Fuehrer."

Chrysler Seeks Executives For Aircraft Engine Plant

CHICAGO—Chrysler's aircraft engine plant, known as the Dodge Chicago Plant, Division of Chrysler Corp., is so far ahead of schedule that thought is being given to completing the manufacturing organization well in advance of production which is scheduled to begin next winter. Seeking 50 executives who will manage various activities including foundries, forge shop, machine shops, assembly and inspection, the company is taking full page advertisements in nine business papers. These men, in conjunction with the nucleus of Chrysler personnel that has carried the project along, will exercise top management functions.

This plant will manufacture Wright engines exceeding 2,000 hp. and which have never before been manufactured in volume. The approximate size of the plant will be twice that of Willow Run and will cost about $165,000,000, employing nearly 45,000 people at peak.

Canada Concentrates on Aircraft and Ships; Stricter Wage Ceiling Enforcement Planned

Conference of Nelson and Henderson with Howe and Gordon shrouded in secrecy

OTTAWA—Emphasis in Canadian war production continues to be on aircraft and ships. The second big contract for construction of Hell Diver bombers for the United States Navy has just come to Canada, being placed with Fairchild Limited. A few months ago Canadian Car and Foundry Company was commissioned to build a large number of these bombers.

At Vancouver Boeing Aircraft of Canada has just launched its first Consolidated PBY flying boat bomber and its plant will be a substantial factor in the production of these patrol craft. The company, starting with about 400 workers in 1939, has now a payroll of 4,500. The Consolidated bomber is also being built in eastern Canada and a new plant is under construction to speed up production.

Canada is now placing war contracts at the rate of approximately $100 million a month. Contracts placed in the first five months amounted to $434 million.

The Nelson-Henderson Visit

Ottawa continues to be very deeply in the dark regarding the significance of the recent trip here of Donald Nelson and Leon Henderson and their fishing resort conferences with Munitions and Supply Minister C. D. Howe and Canadian Price Ceiling Chief Donald Gordon. Close secrecy has been maintained by Canadian officials as to subjects discussed. But the guess here is that the meeting had to do with further curtailment of strategic materials for non-war purposes. The trend towards full coordination of restrictions in behalf of war production has recently been speeded up and it is believed here that the war production and war economy chiefs of the two countries met to study plans for advancing it still further.

Canadian officials now freely speak of the two countries being one in all matters of war production and the application to Canada of Washington's Production Requirements Plan makes unity more than ever the general rule. Canadian manufacturers were allowed until August 1 to file the new form PD 25A. But having filed it, they will receive exactly the same treatment as U. S. manufacturers in the allocation of materials. Canadians file the form with the Canadian Priorities Office in Ottawa and their priority or allocations ratings are certified here without having to go to Washington. In conjunction with the Production Requirements Plan the end-use code devised by Washington is coming into as general use here as in the U. S.

Danger of a raid on stocks of cast iron pipe by municipalities enjoying a boom in tax collections and consequently anxious to spend the money on new or improved services has been stopped by an order of the Canadian Steel Controller barring buying of pipe for new water services except by special permit. Warning has been issued that it will be a waste of effort to seek a permit unless urgent need can be established.

Wage Ceiling Revisions

Stricter enforcement of the Dominion's wage ceiling is provided for in a new revision of the wartime wage-bonus law which places on employers the onus of proving, in case of prosecution, that any wage increases granted or wage rates paid are not in violation of the order. The revision also tightens barriers against discrimination by employers against employees who supply the Wartime Labor Board with information regarding wage rates and bonus or who participate in applications for bonuses. Employers are made liable to a fine of from $100 to $5,000 for discharging or threatening to discharge or otherwise discriminating against such employees. At the same time, however, penalties are provided for employees who commit an act intended to interfere with production in order to induce an employer to violate the order in the interests of employees.

A threatened exodus of married women from wartime jobs in industry and business has been stopped by hurried amendments to Finance Minister Ilsley's annual budget. Married women everywhere in Canada were preparing to quit work when they found that Ilsley's new income tax provisions virtually barred them from adding more than $660 to the family income no matter how much they earned. These provisions lowered a married man's tax exemption from $1,500 to $660 where the wife had a separate income. Under new amendments the wife with a separate earned income is to be treated as a single person while the husband will enjoy the full married exemption.

SNELL TO MACHINE TOOLS POST

OTTAWA—Byron D. Snell has been appointed Deputy Machine Tools Controller, succeeding Roy T. Wise, who resigned recently under pressure of his duties as Director General of the Gage and Cutting Tool Production Branch and as president of Cutting Tools and Gages, Ltd. Since 1941, Mr. Snell has been chief engineer of the Government-owned company, Citadel Merchandising Company, Ltd., which supervises the purchase of machine tools for Canadian war industries.

Ten A Day—These 31-ton tanks are now rolling down the assembly line in a factory somewhere in the province of Quebec at a production rate of ten a day

New Training Center Will Form Ordnance Regiments

WASHINGTON—A training center for new Ordnance requirements instead of the proposed propelling charge plant for artillery ammunition will be established on the 7,000 acre site located near Flora, Miss., according to an announcement by the War Department.

Changes in the requirements program for artillery ammunition propelling charges have made it necessary to operate the propelling charge loading plant at Flora at present, but it will be held in readiness for future requirements, it was pointed out by Major General Levin H. Campbell, Jr., Chief of Ordnance.

At the training center more than 300 officers and several thousand enlisted men will be formed and trained into Ordnance Regiments. These regiments when trained and ordered to the field will operate base shops for repair of weapons and combat vehicles behind the front lines. Smaller maintenance units of Ordnance will also be trained.

Engineering Index Is Out

NEW YORK—The 57th edition of the *Engineering Index* has been published by Engineering Index, Inc., 29 West 39th Street, New York City. The new edition, which covers the year 1941, contains 26,000 annotations of important technical articles and 40,000 cross references as well as an index of authors and contributors.

INSIDE DETROIT

Materials situation reaches critical stage as several war plants close briefly because of lack of materials. One important way to help situation lies in scrap campaign

BY RUPERT LE GRAND, DETROIT EDITOR

DETROIT—More efficient allocation of materials and a general awakening of industry to the seriousness of the scrap and machinery situations are imperative if the country is to come within shooting distance of producing the required $7 billion of armament per month before the year end.

The materials situation has reached such a critical stage that a national scandal is in the making. Plant after plant in the automotive industry is curtailing operations or facing shut-down through lack of some item or items vital to completion of an article of munitions. The closing of Yellow Truck recently because Chevrolet could not get axle steel merely pointed up a condition which has been in the making for months. At least six weeks earlier, one of the largest forge shops in the automotive industry was all tooled up for production of at least 30 different items on subcontract but little if any steel was on hand to make important parts such as aircraft engine crankshafts, tank parts, shell forgings.

Important curtailments are: The Oldsmobile Division of General Motors was forced to drop from seven-day continuous operation to six days a week through lack of steel, with prospects of going to five days and laying off workers in the swing shift.

Fisher Body's tank arsenal will probably produce only about one-third of its August quota of M-4 medium tanks through lack of armor plate.

Motor Wheel Co. received approximately one-half its June steel allotment for an important item and none for July, with the consequence that the final assembly plant dependent upon this vendor may face an extended slowdown or interruption of operations until the Lansing firm can get back into production when steel is received.

Improper Distribution

Chrysler Corporation plants were running short of barrel forgings for the Bofors anti-aircraft cannon urgently needed for naval vessels and merchantmen. Another cannon plant not yet in real production had a large stock of barrel forgings on hand, one-half of which would have kept Chrysler running full-tilt until the forge shop could get a new allotment of materials. Yet the bureaucratic mind either could not arrange for transferring the forgings or could not see the importance of the step.

Another plant has had to apply for a loan to carry an inventory of nearly $10,000,000 worth of materials, which are standing idle because a few materials items will not be forthcoming for a couple of months and production can't be started.

Resort to Directives

Since the materials allocations system has been somewhat lopsided in operation, providing a contractor with say 90 percent of his materials requirements, and failing to get him the remaining and just as vital 10 percent, the armed services resorted to directives in the last two weeks of July. These directives, obtained by application to the Army-Navy Munitions Board, took precedence over AAA and AA series priorities, required materials suppliers to make shipment to concerns mentioned as rapidly as possible. It is said that enough directives were issued to account for 85 percent of steel production through the last quarter.

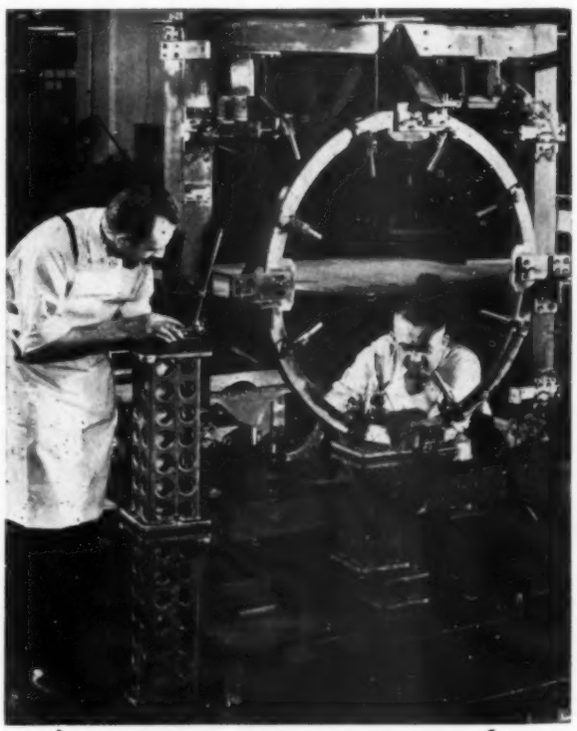
The pinch in bar stock continues especially severe, delivery quotations running as high as 32 weeks. While it is strategically sound to supply bar materials to Lend-Lease first, especially to the Russians so that they can make munitions to their own specifications, there is no lack of bar mill capacity in the country. Perhaps political reasons diverted too much ingot capacity to steel plate production.

Tangle May Be Worse

In light of the fact that the materials situation is in such a mess when the nation is only producing armament at half the planned rate for the fall months, Detroiters with years of production experience are not hopeful that the tangle can be unsnarled. They point to the fact that many large war contracts will soon get into the full production stage when materials will be required in enormous quantities by

GETTING IN THE SCRAP

DETROIT—Scrap metal shipped from 90 General Motors plants engaged in war production totaled 81,261,837 pounds for the month of June. Shipments of iron and steel scrap were 77,540,778 pounds. Most of the rest was aluminum. Most of the scrap came from chips and other sources involved in manufacturing processes. The balance (about 9 percent) came from dismantled buildings and discarded tools, dies, molds, and machinery.



Bomber Jig—Accuracy to the thousandths of an inch is required in building jigs and fixtures for bomber construction. In this picture taken at the Fisher Body Plant, the man at the left is working with height blocks while the one at right checks measurements on this jig for a B-25 Army bomber

comparison with current operations which may not be far beyond the pilot line stage.

One of the most important ways that industry can help to alleviate the materials shortage is to join wholeheartedly in the scrap campaign. Nickel-bearing steels are most in demand. The automobile industry produced 100,000 tons of scrap in June. In the opinion of impartial observers, some firms have done a fair job, others a very poor one, of cleaning house. Sensing that a number of important firms had only scratched the surface, official quarters last week requested an immediate statement on how much obsolete machinery, dies, tools, and fixtures can be sent to the mills. If the auto industry does not accelerate its scrap collection (an extremely complicated affair because of the many factors involved in scrapping certain dies and tools), it may turn out that allocations of materials for war production will bear a relationship to the efficiency of turning in scrap.

The machinery situation is also giving concern. Out of 337,000 machine tools listed by auto companies, only 1,300 critical machines were reported available for use by others. Why? Major reason is apparently the fact that much machinery is assigned against pending contracts, which are never placed. Say bids are asked from seven contractors for a tank-track link or a 55 mm. shell. One gets the order, the other bidders are not notified, and the machinery they have tied up stands idle for weeks. This situation is often aggravated by considerable delay by the services in awarding the contract to the successful bidder. In other words, some system is needed immediately whereby unsuccessful bidders will be notified so that they can either divert the assigned machinery to other purposes or sell it to firms that can make immediate use of it.

Machinery System Needed

The need for a system that will move these "assigned" machines to live projects was pointed up by two pressing requirements. One involves manufacture of hundreds of millions of rounds of small-caliber ammunition for Lend-Lease; the second, the shortage of facilities to form and straighten armor plate.

As a consequence, automotive firms have been asked by WPB to submit a list of available automatic bar machines, hand turret lathes and all sizes of automatic chucking machines. Some of these firms would like to take on contracts for this equipment, others frankly state that their labor situation prevents accepting additional work. In all cases, the firms are to report which equipment is available for sale.

Heavy-duty presses in ratings of 250 tons and up are in great demand for straightening and forming armor plate.

WAR RULINGS IN BRIEF

Checklist of Significant Regulations on Materials and Prices

ANTIMONY—Deliveries of 25 lb. or less are permitted to any one person in one month without allocation, and restrictions on specific uses are modified. (Preference Order M-112.)

COPPER—An amendment has been made to clarify maximum prices which may be charged on sales in carload lots applicable to all other sellers as well as to refiners and producers. (Amendment 2, Revised Price Schedule 15.)

COPPER-ALLOY SCRAP—Reductions in maximum prices for 13 classifications have been announced. (Amendment 1, Revised Price Schedule 20.)

FARM MACHINERY & PARTS—This order has been re-issued to codify the original document and amendments. (Amendment to Limitation Order L-26.)

HAND TOOLS—Simplification of sizes and standards have been provided to help conserve materials. (Limitation Order L-157.)

INDUSTRIAL DIAMONDS—Sales and deliveries are subject to the General Maximum Price Regulation. Their status had been in doubt. (Amendment 13, Maximum Price Regulation.)

LAMPS AND SHADES—Manufacturers are permitted to use up existing supplies of fabricated or semi-fabricated metal, metal parts, lamp cords, silk. (Amendment 3, Limitation Order L-33.)

LEAD—Provisions of the price schedule to cover lead-antimony alloys with antimony content as low as one-fourth of one percent has been announced. (Amendment 5, Revised Price Schedule 70.)

MACHINERY—Manufacturers under government and lend-lease contracts and subcontracts are not required to obtain temporary permits in order to charge higher prices pending decision on applications for price relief. (Amendment 1, Maximum Price Regulation 136.)

MACHINES, PARTS AND MACHINE WORK—To remove overlapping in supplementary regulations an amendment has been issued exempting these items from the provisions of Supplementary Regulations 1 and 2. (Amendment 4, Supplementary Regulation 2.)

OFFICE MACHINERY—Production quotas originally established do not include machinery not covered by restrictions on distribution imposed by the order. (Amendment 1, Limitation Order L-54-c.)

OIL CANS—Use, sale, or manufacture of lubricating oil cans made of any metal is prohibited after September 30, 1942. (Supplementary Order M-81-b.)

RUBBER AND PRODUCTS—More stringent specifications have been made for further conservation of these civilian products. (Amendment 9, Order M-15-b-1.)

SUPPLIES—Prime contractors to whom preference ratings have been assigned on PD3A certificates are entitled to use the rating within specified limits for operating supplies and to replace materials in inventory. (Interpretation 1, Priorities Regulation 3.)

THERMOPLASTICS—Scheduling of operations by manufacturers has been postponed until August 15, 1942. (Amendment 1, Preference Order M-154.)

Campbell Sets Up Ordnance Field Director in St. Louis

WASHINGTON—To speed delivery of arms by decentralization and direct contact with plants, Maj. Gen. Levin H. Campbell, Jr., chief of Ordnance, has ordered a field director of ammunition plants set up in St. Louis to coordinate and direct the activities of plants.

In addition, the Production Section, Small Arms Branch, and the Gage and Gage Facilities Section of the chief's office now in Washington are being moved to Philadelphia. They will perform there all the functions pertaining to production of small arms.

General Campbell said the other day that his Washington staff would get smaller before it gets larger—a refreshing viewpoint in the capital. Nearly 70 officers and 150 civilians are being transferred away.

"I want the man in industry to know that he has someone on the other end of the telephone who talks industry's language," the General said. The most important job, the Ordnance chief explained, is development of new weapons to surpass enemy inventions. Equally important is production and procurement of 2,000 Ordnance items and a quarter million parts.

Stamets Has Anniversary

PITTSBURGH—The William K. Stamets organization is celebrating its thirtieth anniversary in rendering nationwide service to machine tool builders and users. Beginning in 1912 as a sales organization entirely, the firm soon expanded into engineering development work.

During World War I an engineering department was added, engaged principally in designing the Stamets gun boring lathe. In 1919 further expansion of the sales organization necessitated the opening of a branch office in Cleveland. A special single-purpose machine for the pipe industry was produced soon after that time. Other machines produced by the Stamets organization include a line of shell turning equipment and special bomb boring and tapping machines.

WARTIME WASHINGTON

Successful substitution of steel for brass in artillery shell is major achievement. SWPC proves a disappointment. Russian deliveries reported ahead of schedule

BY BLAINE STUBBLEFIELD

WASHINGTON—Successful substitution of steel for brass in the production of artillery cartridge cases, just announced by the War Department, is a major Ordnance achievement.

The use of pressed steel for one primer case measuring less than one inch will save 11,000 tons of copper in 1942-43. The overall saving of copper, urgently needed in airplanes, tanks and ships, will be of enormous strategic importance.

AMERICAN MACHINIST has learned that Ordnance expects to eliminate brass from shells entirely, even eventually including small arms cartridges. The only exception will be shells for anti-aircraft and air-borne guns. Although jamming of shells is rare even at the present stage of development, the absolute minimum of stoppages must be maintained in these two types.

It was hoped, early in the war, that a substitute could be found for the great volume of copper it takes to make shells. War devours mountains of metal in shells, and much of it is not recoverable. Early in the war Germany succeeded in making shells of steel. For more than a year now, U. S. Ordnance has been working on various methods of converting to steel.

Several Methods Used

Briefly, this is the problem: When a gun is fired the barrel expands instantaneously, then returns to normal. The shell of course expands also and it too must return to normal almost instantly, else it cannot be ejected. Brass shells behaved perfectly, and were universally used.

Just how the special Ordnance committees and the manufacturers worked out the technique of pressing steel into shells is not told. Many methods were tried, and several still are in use. Eventually these may simmer down to one. Over 30 manufacturers are now producing steel shells.

The pressing of components formerly produced by forging, casting and automatic screw machine processes saves machine hours, and much expense.

Having achieved this conversion from brass, Ordnance complains that it still faces a steel shortage. Some Ordnance officials privately blame WPB for not restricting the use of steel more sternly. The question of whether there is a steel shortage is badly confused, and WPB is moving to straighten it out.

Reduction in the steel program simply means that a gleam in WPB's eye has been dimmed. No projects actually under way are being halted. And there's still substantial expansion. Estimated June, 1943, output of 98,279,970 tons of steel ingot is 9,710,000 tons higher than at the end of last year—as compared with an increase of 10,762,000 projected by the SPAB program of last September. Pig iron expansion is reduced more sharply than steel, from 13,810,550 tons to 10,945,000 or 21%. This leaves pig and scrap supply barely in balance with steel output, and any cut in scrap supply would put them seriously out of balance.

Dirge for SWPC

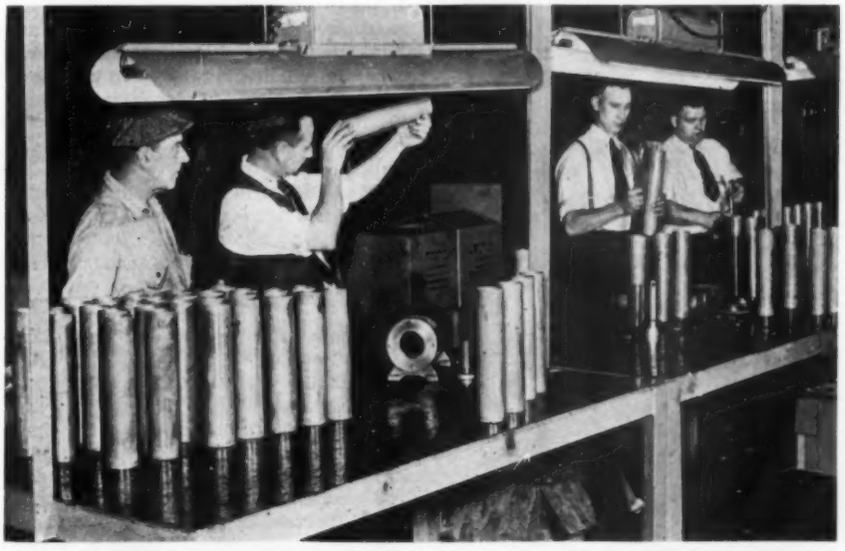
Don't set your hopes too high, if you're a small businessman, on WPB's new Smaller War Plants Corporation (*AM*—Vol. 86, page 798c). Washington is already composing obituaries for SWPC. Lou Holland, director of the corporation, hasn't made a good impression. And it's beginning to be realized that the job of enlisting little businesses in the war effort at this late date is a nearly impossible one. When we're worrying over keeping present plants supplied with material is a bad time to talk about giving contracts to another plant.

Russian Deliveries

There are constant reports to the contrary, but officials who should know insist that deliveries of war goods to Russia are running ahead of the schedules set up in the U. S.-Soviet protocol. A few individual items are behind, but the total shipments of finished military goods are ahead. Published reports that only 10 percent of war goods output is going to Russia are too low. Including food supplies and raw materials, about half the $50 billion to be spent on war this year is allocated to Lend-Lease.

The Working Hour Question

Adoption by federal agencies of the policy that maximum production can be attained when workmen work a six-day 48-hour week doesn't mean that no one is going to work longer than that. Obviously, the controlling point is whether enough workmen can be found with the requisite skill to man the plants without working longer than this. Effect of the policy is to put moral pressure on industry not to use long workweeks unnecessarily. It's estimated that about 1,500,000 men now put in more than a 48-hour week. Longest hours, an average of 55, are worked in the machine tool industry (where skill requirements are hardest to meet). Engine, turbine, and motor plants average 51. Aircraft and shipbuilding are only slightly above 43.



Steel Shell Cases—Artillery shell cases undergo rigid Ordnance inspection in the plant of the Buick Motor Company. More than 30 manufacturers are now producing steel shell cases like these with a great saving in copper, which was formerly used. It is hoped eventually to eliminate brass from shells entirely

Higgins Shipyard Contract Cancelled; Steel Channeled to Actual Shipbuilding

Program exceeds expectation; Commission stop order now investigated by Congress

WASHINGTON—Cancellation by the Maritime Commission of the Higgins New Orleans contract for a vast ship assembly yard and 200 Liberty ships, is loaded with contradictions. The Commission stated substantially its real reasons for dropping Higgin's anchor:

1. A few weeks back, Donald Nelson told the various branches of WPB to stop approving new plant construction which could not be completed till the middle of next year. The Higgins cancellation is in line with that policy.

2. Steel being channeled into construction of the Higgins yard will be diverted to actual shipbuilding in producing yards.

3. The Higgins yard was contracted for at a time when construction was at the rate of four to four and a half ships per way per year. Now, unexpectedly, the rate is six to eight ships.

4. This rate will exceed the President's program of 8 million tons or more this year and a total of 24 million tons in 1942–43, and this rate is using and will use all the available steel in sight. If more steel becomes available the yard program will be increased.

5. The Higgins yard could not be in full production before some time in 1943.

6. The estimated cost of Higgins' yard is now up to $65 million which, the Commission says, would make his per-ship cost exceed any previous Commission figure.

This statement of reasons for halting the Higgins project appears to constitute the Commission's own charge of its own mistake. Plainly, the commission failed to foresee the speed at which ships could be built. Informed sources contacted by AMERICAN MACHINIST say privately, and no doubt they will testify at hearings to come, that high officials of the Commission made a hurried survey of the Higgins site and his plans, and entered into an ill-considered contract. Gossip says that the site is a swamp, and that quicksand has been encountered.

Project was Gamble

Admiral Land now repeats to Congress what he said off the record months ago—that he believed, at the time the contract was made, that Higgins had about a 50–50 chance of accomplishing his ship-a-day objective. Thus, the Commission's action appears to have been partly error and partly a risky effort, better tried than left undone.

Any one who frequents the Commission's Washington offices could see that they were impressed with Higgins' audacity and his determined energy. In fact, Admiral Land once said the Commission was taking a gamble on Higgins' imagination, which he had turned to good purpose in building Navy torpedo and landing boats.

Both houses of Congress are investigating the Commission's stop order. Main charge, brought by Mr. Higgins and others, is that the old-line ship builders brought pressure on the Commission to squelch the newcomer, and that they were holding large inventories of plate, which contributed to the shortage. Particularly is suspicion leveled at Bethlehem, which makes both steel and ships. It is true that some old-liners ridiculed Higgins fairly openly, but the serious charge of actual collusion might be hard to prove. It would be hard for persons who know Land to believe that he would submit to any such tactics.

Plate Shortage Disputed

Some of the apparent contradictions mentioned above are that while Nazi submarines are outpointing ship construction, the biggest prospective building program is shut off; while the Commission claims a steel shortage, Higgins claims the builders have inventories; independent steel authorities say there is no shortage of plate, that the shortage is shapes, tubing, castings, and propulsion machinery; others say there are no shortages at all, that the way to look at it is that the program is 2 million tons ahead of the President's program.

Majority opinion indicates that the Administration will support the Commission; that Higgins, whose ability is highly regarded, will be given a contract for something else; that his proposal, supported by the New Deal contract wizard Henry J. Kaiser, to build big flying boats in shipyards, is probably impractical—even if United Nations strategists and WPB decide to build them.

Perfect Balance—Among the items never before manufactured in Canada which are now turned out in large quantities is the constant speed propeller. In this plant a technician checks the balance of the blade

Einig Resumes Managership

CLEVELAND—A. B. Einig, who has been administrative chief of the Tool Branch of WPB and OPM for the past two years, has resigned his connection with the board and has resumed his position as general manager of Motch & Merryweather Machinery Company.

A. B. EINIG

MDNA Officers Elected

CHICAGO—Samuel Danits was elected president of the Machinery Dealers' National Association at the annual meeting on July 23. Mr. Danits is connected with the firm of Donberg & Danits. Other officers elected at the meeting are Floyd L. Frye, Frye Machinery Co., first vice president; George J. Feinberg, Inland Machinery Co., second vice president; Sam Barron, Lake Machinery Co., treasurer; Josephine Corcoran, secretary.

SAMUEL DANITS

Current Steel Needs Force Cut in Expansion Plans

WASHINGTON—Of the 10,000,000 tons additional steel capacity authorized months ago by SPAB, only 65 or 70 percent will be completed. A general review of all new war industry plant construction is now being made by WPB to determine which shall be curtailed, and how much. OPA Administrator Leon Henderson said that in general, plants producing basic materials would probably be cut no more than one-third.

At least 70 percent and possibly more of the projected increase in pig iron capacity will be completed. Capacity for aluminum and magnesium are not being curtailed at all.

"Industry must get ready to patch and pray," said William L. Batt, chairman of WPB's Requirements Committee. "The military has taken from civilians to meet its needs, but that pool is about dry. From here on out it will be a continuous problem to provide materials for the armed forces."

These steps will be necessary: (1) long-range planning of materials needs and careful scheduling to meet them; (2) revision of specifications to reduce the scarce materials used; (3) extensive use of substitutes; (4) a vast increase in civilian salvage of scrap metals and rubber; (5) careful handling of scrap and secondary metal by industry to get the greatest use from it.

Batt said that some shipways may stand idle for lack of steel and some ammunition lines may slow down for lack of copper and brass. He expressed hope that these situations would be temporary.

Washington Appointments

WPB, Industry Advisory Committees:

Presiding Officers: R. J. Lund, Silver Producers and Distributors; Erwin Vogelsang, Primary Lead Producers, Metallic Lead Products Manufacturers.

WPB, Procurement Policy Division:

Dewey L. Pierce, Commodity procurement advisor, Paint, Varnish, Lacquer and Waxes.

WPB, Smaller War Plants Corp.:

Lou E. Holland, deputy chairman.

WPB, Field Offices:

A. E. Bowman, director, Region 12, headquarters Minneapolis, Minn.

Milton H. Luce, acting deputy director, Region 10, headquarters Seattle, Wash.

War Manpower Commission:

A. A. Liveright, director, Baltimore area office.

BUSINESS ITEMS

Westinghouse Electric & Mfg. Co. X-ray division manufacturing plant has been moved from Long Island City to Baltimore, Md. Edward F. Moran has been promoted from sales manager to assistant to the manager of the division.

Cincinnati Planer Co. is serving its customers in New England, New York State, northern New Jersey and part of Pennsylvania direct from its Cincinnati office with the exception of the Syracuse territory, which is being handled by the C. H. Briggs Machine Tool Co.

Tight Closure Co., 3056 W. Meinecke Ave., Milwaukee, Wis., has become established in the plastics field as custom molders of thermosetting plastic products.

Northrop Aircraft Corp. will build a bomber assembly plant at the cost of about $5,000,000 in the Rocky Mountain area.

NAMES in the NEWS

Ira J. Snader, division manager of the Republic Aircraft Products Div., The Aviation Corp., has been made vice president of manufacturing of the corporation. He became associated with the organization in 1940 and for eight years prior was in charge of machine tool design and production at the Ex-Cell-O Corp. Appointment of Sterling B. Withington to succeed Mr. Snader as division manager has been announced. For the past two years he has been connected with the Brunswick-Balke-Collender Co. and previously with Pontiac Motor Div. for twelve years.

Ernest S. Jefferies was named president of Universal Boring Machine Co. at a recent meeting of the board of directors. Other officers elected are Charles A. Clarke, vice president and chairman of the board; Joseph Wiggin, vice president; Alson H. Goodsell, treasurer.

H. K. Clark, vice president and general manager of the Norton Company, who recently returned to Worcester after nine months service in the OPM and WPB, most recently as assistant deputy director of the Division of Industry Operations, is back in Washington. This time he has been "drafted" by the Navy and with the rank of Lieutenant Commander is a member of the Army and Navy Munitions Board.

William F. Sherman will edit *Production Information*, a publication distributed to automotive executives designated by their firms to receive it. Published by the Automotive Council for War Production, the periodic report will serve to freely exchange production facts and ideas between companies. Mr. Sherman for the past five years has been Detroit correspondent for *The Iron Age*.

Victor H. Lawrence has been appointed general superintendent of the Otis Works of Jones & Laughlin Steel Corp., Cleveland. He joined the organization of the Otis Steel Co. in August, 1941 as assistant to the president.

Clifford O. Richards, formerly assistant purchasing agent of Taylor-Wharton Iron and Steel Co., has been advanced to purchasing agent to succeed R. C. Schaeffer. Prior to joining the company in January, 1941 Mr. Richards was associated with the Fitz Chemical Co.

Ralph Shoemaker has been appointed general master mechanic of the Bullard Company. He has been connected with the company for 32 years.

Frederick C. Horner has given up his position as assistant to the chairman of

• *Assume Aviation Corp. Positions* *Machine Co. Head*

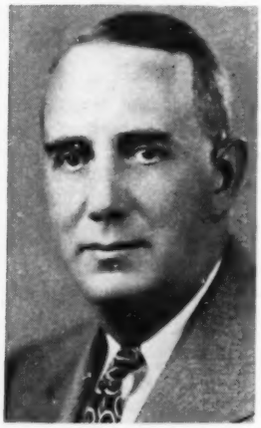
IRA J. SNADER

Powell's Studios

S. B. WITHINGTON

E. S. JEFFERIES

J.&L. Steel Supt.



V. H. LAWRENCE

Purchasing Agent

C. O. RICHARDS

General Motors Corp. on transportation matters to devote full time as chief of the Highway Transportation Div., Transportation Service, Service of Supply, War Dept.

James F. McNamara has been made chairman of the board of Harvill Aircraft Diecasting Corp. He is mill products sales manager of the International Nickel Co. and a director of the Lukens Steel Co.

R. S. Neblett, assistant manager of the turbine division of General Electric Co. for the past three years, has become connected with the Bureau of Ships of the U. S. Navy at Washington.

Robert M. Kalb has been appointed chief engineer of Kellogg Switchboard & Supply Co. He has had long experience as a telephone research engineer and was previously assistant chief engineer of the company.

Dan C. Hungerford, who has been associated with the Elastic Stop Nut Corp., Union, N. J. since 1936, has resigned as vice president and director.

Howard M. Dawson has been placed in charge of the Export Dept. of Jessop Steel Co. with headquarters in the New York office, and Fred Jessop Wood has taken over Mr. Dawson's duties at the Detroit branch.

George H. Kendall has resigned his position with Norma-Hoffmann Bearings Corp. to devote full time to consulting engineering practice on war problems of fabrication processes, manufacturing investigations and special machinery development and invention.

Russell E. Ebersole, assistant manager of the northeastern district of the Lamp Div. of Westinghouse Electric & Mfg. Co., has been made manager of the middle western district with headquarters in Chicago.

Russell J. Goodnow, Jr., president of the Machine Parts Corp., Providence, R. I., has been appointed manager of a newly established appeals department of the WPB New England regional office.

George Lowe has been named supervisor, new business research, Carnegie-Illinois Steel Corp.

Elmer W. Silver, secretary of Whitehead Metal Products Co., Inc., has also been elected treasurer of the company.

Henry Fishbeck has been transferred from the inspection department to the manufacturing department at Pratt & Whitney Div., United Aircraft Corp.

OBITUARIES

Howard D. Colman, 69, founder and president of Barber-Colman Co., died recently. He was an inventive genius and developed several machines in the textile industry as well as various electrical devices. At the time of his death, Mr. Colman was engaged in experimental work in connection with national defense.

William L. Rianhard, 81, treasurer of Whitehead Metal Products Co., Inc., passed away suddenly. He began his career in the metal industry in 1881 and was connected with the American Brass Co. and in 1898 joined U. T. Hungerford Brass & Copper Co., from which he retired in 1916. Mr. Rianhard joined the Whitehead Company in 1917 as assistant treasurer and director, and became treasurer of this subsidiary of the International Nickel Co. in 1924.

Perrin G. March, 55, president of the Cincinnati Shaper Co. died suddenly of a heart attack at his home in Fernbank. He was the son of the founder of the company, and was educated at the University of Cincinnati and Ohio State University. Mr. March held memberships in the National Machine Tool Builders' Assn., Ohio Mechanics Institute and Cincinnati branch of the National Metal Trades Assn.

Charles L. Cornell, 80, electrical engineer and former executive vice president of Niles-Bement-Pond Co. died recently in Plainfield, N. J.

S. Houghton Cox, vice president and director of the Cleveland Twist Drill Co., died in Pasadena, Calif.

Henry G. Reist, 80, passed away after a short illness. He retired in 1931 as head of the motor and generating

Blank & Stoller

PERRIN G. MARCH

engineering department of the General Electric Co.

William W. Anderson, sales manager of Nicholson File Co. for the past two years, passed away recently in Providence, R. I., after a brief illness.

John L. Bossert, sales engineer for the past 17 years of Ward Leonard Electric Co., died at his home in Mount Vernon, N. Y.

MEETINGS

National Safety Council. Annual meeting. Stevens Hotel, Chicago, Ill., Oct. 5–9.

National Metal Congress and Exposition. War Production Edition. Cleveland Public Auditorium. Oct. 12–16.

American Welding Society. Annual meeting. Hotel Cleveland, Cleveland, Ohio. Oct. 12–16.

American Society of Tool Engineers. Semi-annual meeting. Kimball Hotel, Springfield, Mass. Oct. 16–17.

Wire Association. Annual meeting. Detroit-Leland Hotel, Detroit, Mich. Oct. 19–23.

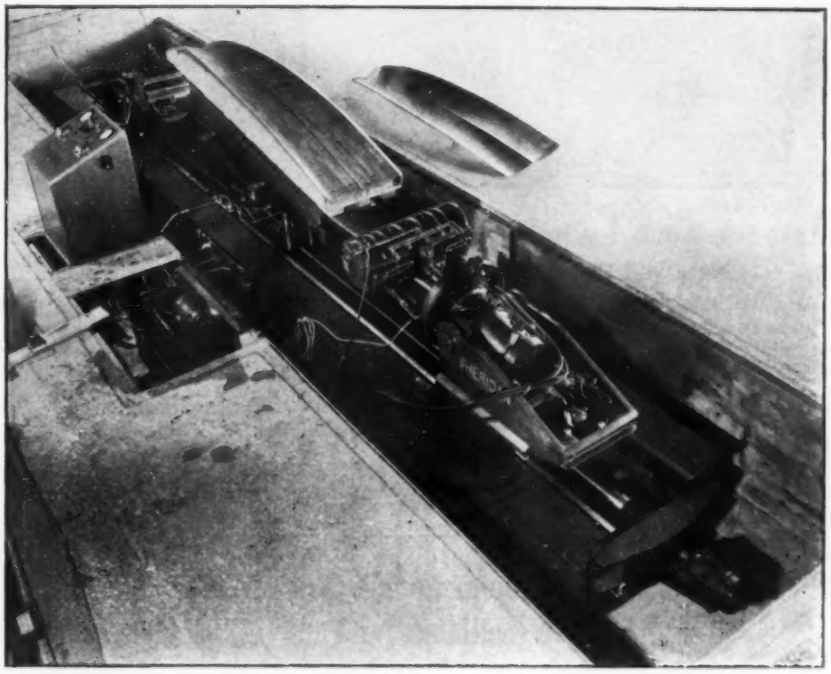
National Electrical Manufacturers Assn. Annual meeting. Waldorf-Astoria Hotel, New York, N. Y. Oct. 26–30.

SHOP EQUIPMENT NEWS

Sheridan Sheet Stretching Press Replaces Manually Operated Machines and Handles Large Aluminum Sheets

A sheet stretching press which replaces manually operated machines has been developed by Sheridan Iron Works, Champlain, N. Y. This unit can stretch a 175 or 245 aluminum alloy sheet 267 in. long, 48 in. wide and 0.081 in. thick into a continuous double curvature of varying radius. Time required is 1.73 min. after the sheet has been inserted in the jaws and placed over the block.

Two 60-ton hydraulic tension cylinders are mounted on trunnions. The jaw may be elevated in an arc about the trunnion pin. The elevation of this unit is accomplished by hydraulic cylinders acting through racks and pinions.



The entire slide unit carrying the cylinder and jaws slides on ways. The slide units are propelled by gear motors through 6 in. diameter adjusting screws, each of which is approximately 20 ft. long.

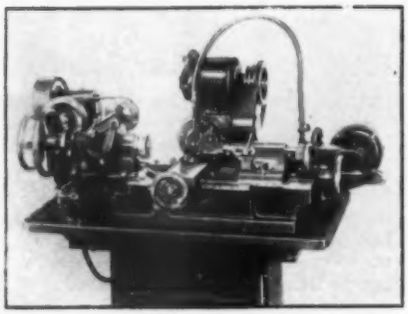
The block table is supported on three rams. The right hand ram is separately controlled and the two left hand rams move as a unit. These support rams enable the operator to set the block at the height and angle which will give the best pull of the sheet over the form block by the tension cylinders. The flexibility and ease of adjustment of the machine is especially important since the correct angle of pull is essential.

The block remains stationary throughout the stretching operations and the jaws act in a constant predetermined direction to maintain the best angle of pull over the edge of the block. By this means sheet breakage is virtually eliminated.

In operation, the operator determines the best speed at which to stretch over each end of the form block and sets the flow control valves to these speeds. He sets relief valves to pressures just under which the sheet will break. With the sheet installed in the jaws and over the block he then pushes the control button and both jaws move at the predetermined speeds and stop automatically when the sheet is completely formed.

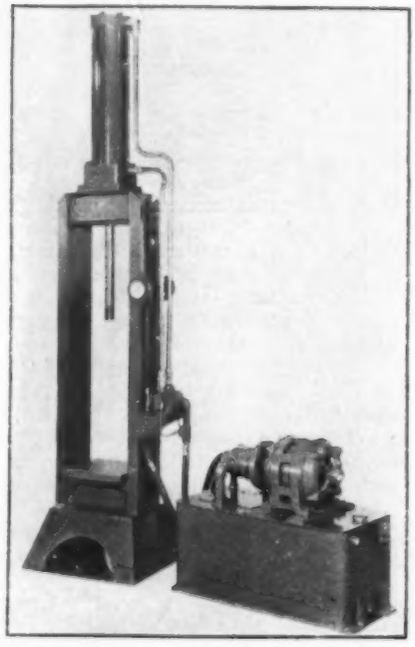
Small Work Handled on Waltham Motorized Thread Milling Machine

Several design changes have been incorporated in the new thread milling machine recently announced by the Waltham Machine Works, Waltham Mass. The machine is now completely motorized and is especially suited for small work with diameter of 2 in. or smaller. The standard equipment includes three motors with push button start and an automatic or push button stop, a follow rest, one milling cutter, indexing device for cutting multiple threads, 5-pitch lead screw and change gears for cutting 5 up to 40 threads per inch. The motors are generally 1/3, ¼ and 1/6 hp. Individual speed change is allowed and reverse for both the cutter and the work and a constant speed for the pump. This machine can be arranged with speeds suitable for either brass or steel and by changing ratios for both. A single start and stop station controls all motors at one time. The equipment occupies a floor space of 48×34 in. and weighs 850 lb. net.



Hydraulic Machinery 25-Ton Press Has Fully Hydraulic Operation

A 25-ton capacity fully hydraulic press has been brought out by Hydraulic Machinery, Inc., Detroit, Mich. The machine has a 30-in. stroke, 60 in. of

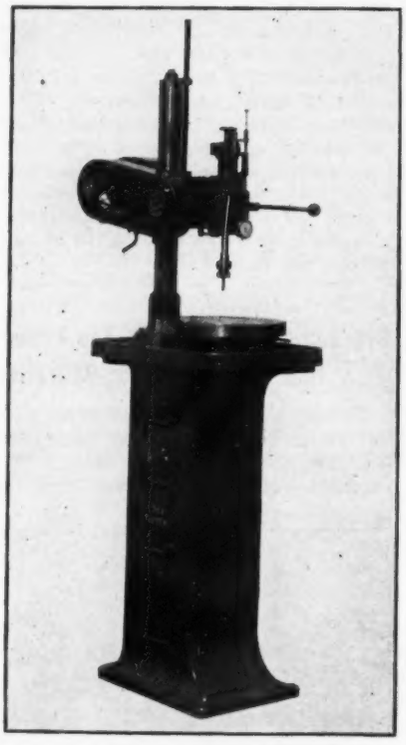


daylight with 4.4 in. closing speed per second, 0.8 in. high pressure speed per second and an opening speed of 5 in. per second. It is equipped with a combination pump, relief, check and unloading valve, 7½ hp., 3 phase, 60 cycle motor operating at 1200 r.p.m. The control valve is manually operated, controlling the direction of the ram. The pressure gage capacity is 3,000 psi.

Brand Beach and Floor Models For Precision Hole Tapping

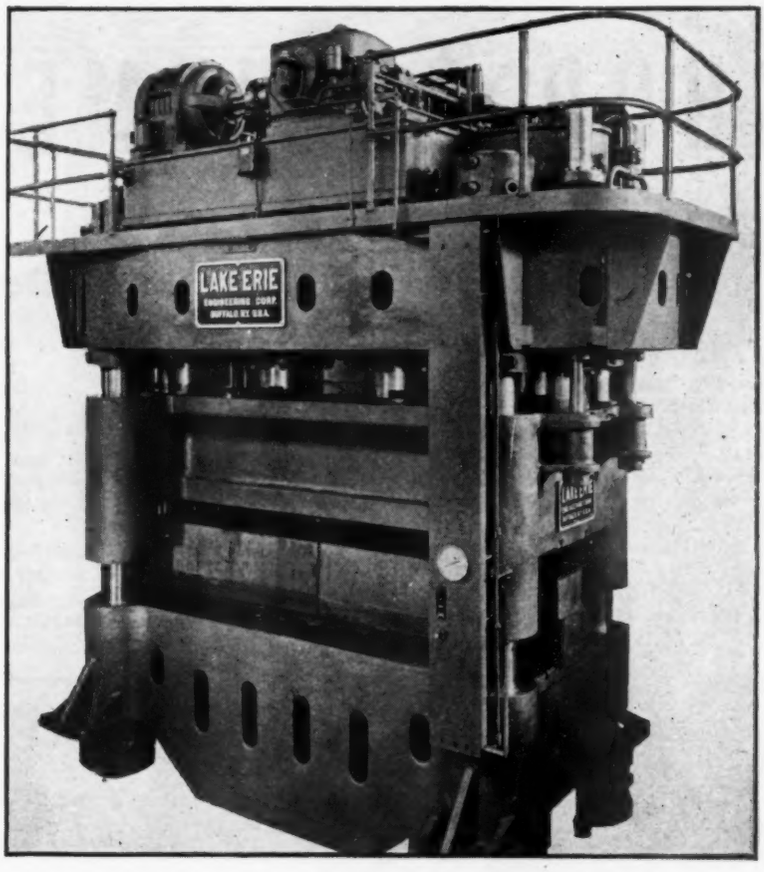
Improvements have been made in the M & L tapper, formerly made only as a table model, produced by Brand Tool & Supply Co., 344 N. Vermont Ave., Los Angeles, Calif. The machine is now available in bench and pedestal or floor models which give identical performance for precision tapping 0 to ½ in. on chrome moly steels, and up to ¾ in. on softer metals such as aluminum, brass and plastics.

Simplicity of operation makes the machine especially useful in the small shop and no skilled help is necessary



to operate this machine. The tapper is manually operated and controlled and driven by a 1/3 or ½ hp. 50-60 cycle 110-220 single phase or three phase special constant speed ball bearing motor with tapping speeds 95 to 395 r.p.m., having reversing speed twice that of the forward speed. The drive is a four-step cone grooved V-belt pulley. A dial indicator is furnished for bottom tapping.

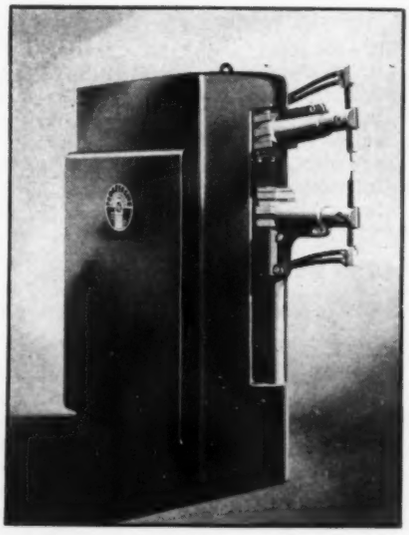
The floor model with base 36 in. in height is equipped with a coolant system, and the centrifugal pressure pump is directly connected to a 1/30 hp. 50-60 cycle motor. A steady stream can be used or cut out entirely.



Lake Erie 3,000-Ton Hydraulic Press Will Bend Armor Plate

Announcement of a 3,000-ton hydraulic press has been made by the Lake Erie Engineering Corp., Buffalo, N. Y. It is designed for use in bending armor plate and handles relatively large pieces. The entire unit is self-contained with 150 hp. pump which is located on top. Daylight measures 42 in. and stroke 42 in. Ram speeds range up to a maximum of 200 in. per min. approach and 12 in. per min. pressing at 3,000 tons. A hand lever mounted at the right side of the press provides extremely sensitive pressure control. A pressure gage of large diameter is mounted on the control panel. Pressure is applied equally across the upper platen by four large diameter rams. The platen is guided by unusually long hand scraped guides, bearing on accurately machined columns.

Progressive Welder Line of Rocker-Arm Welding Machines Available for Foot, Air, Motor Operation



A line of rocker-arm welding machines has been produced by Progressive Welder Co., 3001 E. Outer Drive, Detroit, Mich., available in 48 models, which are foot, air or motor operated. In the foot-operated type the pressure to bring the electrodes together is obtained through pressure on a pedal connected to the rocker arm by a system of mechanical links. A limit switch to initiate operation of the contactor at proper pressure is mounted on the overtravel spring.

Pressure for the air-operated types is provided by a single-acting cylinder with piston rod connected to the rocker arm, with a pressure regulator as standard equipment and spring pressure returning the points after completion of weld.

The rocker arm welders of the motor-driven type are provided with a ½-hp.

TWO PLANTS converting to war production were buying new lathes. One wanted 25 Monarchs, the other, 18.

But—other plants needed new lathes, too. Needed them badly. Decreasing these two orders would not only permit faster delivery, but would save lathes for other users.

Our technical field men studied production methods and schedules. They found that by taking full advantage of Monarch's wide utility and timesaving features, 18 lathes would do the work in one plant, and 10 in the other. Result—15 Monarchs made available for other producers.

Such incidents are common in the work of Monarch Engineers. They know that Monarchs can do more work than is usually set up for them . . . that Monarchs' power and rigidity enable them to take the severe service demanded today, without flinching, with no letdown in dependability and accuracy.

Even with 1942 production twice that of 1941, and four times that of 1940, Monarch lathes continue to maintain their unvarying quality.

THE MONARCH MACHINE TOOL CO. • • • SIDNEY • OHIO

MONARCH LATHES

COVER THE TURNING FIELD

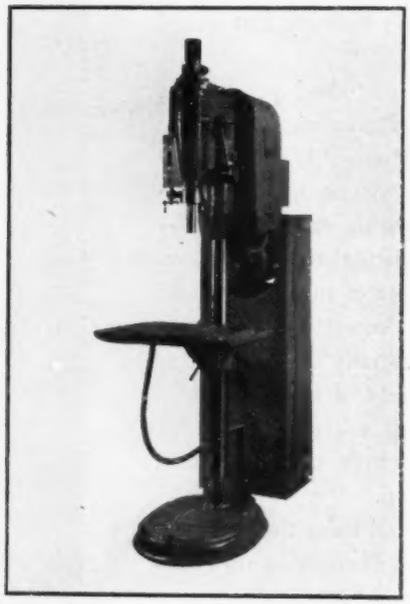
motor, operating the rocker arm through a Reeves variable speed drive, 1 to 3 variation, and worm reduction gear and cam. The control switch is foot operated. The streamlined rocker arm welders are available in four capacities with three types of drive and full range of throat depths from 12 to 36 in. Standard capacities are 20, 30, 40 and 50 kva., and 50/60 cycle supply.

The lower arms are so designed as to provide a range of vertical adjustment giving a throat opening of from 8 to 16 in. with electrodes together. For a 12-in. throat depth the standard point opening is 3½ in. The lower arm may also be rotated in the holder so that welding can be performed with the electrodes at an angle instead of vertical, when necessary.

These welders are equipped with heavy duty transformers with water-cooled secondaries and steel cores with pancake coils. An eight-stage heat regulator, quickly adjustable from the rear of the machine, is mounted on the back of each transformer. The overall width of the welder is less than 19 in. and height less than 55 in.

Cleveland Lead Screw Tapper Equipped for Bottom Tapping

Model D lead screw automatic tapping machine has been announced by Cleveland Tapping Machine Co., 1725 Superior Ave., Cleveland, Ohio. The direction of rotation is controlled by a push button. The spindle can be stopped in



any position desired, and started from that position in either direction. The depth stop gage is so sensitive that the reverse of the spindle is controlled within two cycles, and the vertical travel of the spindle can be adjusted to exact depth desired by an indicator on the faceplate, making it suited for bottom tapping. The lead screw assembly is mounted on top of the housing while the lead screw nut is fastened directly to the spindle. Spindle speeds are 275, 375, 475 and 600 r.p.m.

Deepfreeze Santocel Chiller Developed for Low Temperature

Development of a Deepfreeze Santocel extreme low temperature metal chiller has been announced by Motor Products Corp., North Chicago, Ill. The unit is offered in two sizes, known as the "Santocel" cycles from minus 40-50 deg. and the Cascade "Santocel" cycles minus 120 deg. and lower. Among its applications is contraction in compound fitting of metal parts. This facilitates slide fits in assembly operation, relieves strain and possible fractures. In a machine tool plant the metal chiller has been found to eliminate messy handling of dry ice, loose fit of bearings on spindles, misuse of bearings during assembly, to save time in assembling boring bar bearings used in precision boring machines and to eliminate out-of-roundness and misalignment caused by excessive pounding on bearings during assembly. The Santocel unit is portable and can thus be taken to the particular job where its use is required.

Hard, Soft Metal Handled on Challenge Abrasive Cut-Off Machine

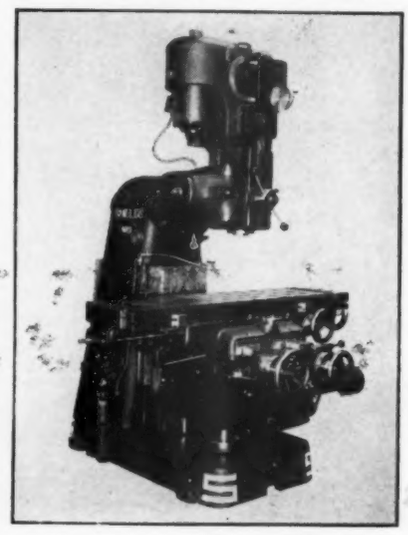
The Challenge Machinery Co., Grand Haven, Mich., has announced an abrasive cut-off machine to handle any hard or soft, tubular or solid metal, including hardened tool steel. It is equipped with an elastic cut-off wheel, and an adjustable safety guard above the wheel to protect the operator's eyes. A ball bearing type spindle is used and an adjustable miter gage is included for cutting-off operations. The machine has a capacity up to 1-in. round, with adjustable table 15×14 in., and can be plugged into any light socket. An all-steel stand, 16×22×34 in., is available.

Shields Milling Machine Performs Varied Operations At One Set-Up

Varied operations such as boring, milling and drilling on many faces of a job at one set-up can be performed on the No. 3 vertical universal vari-angle milling machine produced by Shields Manufacturing Co., Inc., 38-09 24th St., Long Island City, N. Y. By means of throwing the milling head at any angle the machine can also do the work of a standard universal milling machine.

The upper part of the column contains a large bore for reception of a swivel drum. A worm wheel of large diameter is attached to the swivel drum, meshing with a worm mounted on ball bearings inside the column. The swivel is securely clamped when in any position by means of a large diameter flange acting as a brake. A locking drum, locked by means of a single nut, fits over the flange. To change the angular direction of the spindle in a longitudinal direction the locking nut is loosened and the head can be swung into new position by turning the worm handle which is fitted with a dial showing one turn as 5 deg.

A 3-hp. motor drives the spindle through Reeves variable speed pulley, giving every revolution of speed by a turn of the handwheel. The drive is either direct or through hardened spiral gears. The back gears and clutch are thrown in and out by means of a single lever, the two movements being connected by a link mechanism. A four speed sliding gear transmission is incorporated in the head for power feed down to the spindle of 0.005, 0.007,



Information supplied by "American Machinist"

Now that time is the essence, a good many ingenious methods of saving it have been developed. One of them deals with the painting of castings.

An organization using a number of fairly complicated castings paints them before machining instead of afterward, as is the usual custom.

The method saves time because (a) it is not necessary to cut and apply masks for machined surfaces, and (b) painters can work faster.

Finishing, which was formerly a bottleneck is no longer such. Finishing overhead charges have been reduced about 75%.

The system has developed supplemental advantages. Machinists tend to be more careful of painted castings, hence there is less trouble from surface blemishes occuring during machining. The castings do not shed sand and dust when being machined. As a result, the shop is much cleaner.

CLIMAX FURNISHES AUTHORITATIVE ENGINEERING DATA ON MOLYBDENUM APPLICATIONS.
MOLYBDIC OXIDE—BRIQUETTED OR CANNED • FERROMOLYBDENUM • "CALCIUM MOLYBDATE"

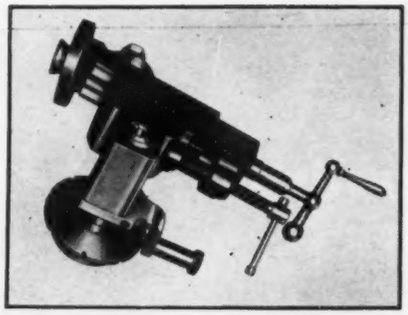
Climax Molybdenum Company
500 Fifth Avenue • New York City

MOLY

0.010, 0.014 per revolution. The spindle can be moved by hand or with power feed by pressing in the handles. A positive clutch must be engaged also, which can be thrown out by a trip set on the slide. A 1-hp. motor supplies the power for the power feeds. The rate of feed can be varied by the turn of a handwheel with the rate shown by a dial behind it.

"Thompson" Milling Fixture Adaptable to Bench Lathe

For use on any standard bench lathe the Auto-Ordnance Corp., Thompson Div., 1437 Railroad Ave., Bridgeport, Conn., has available the "Thompson" universal milling fixture with a 3-way



circular swing. The vise and universal slide base can be used without index fixture for straight or angular milling. The fixture can be efficiently used for milling punches, end mills, keyways or manufacture of duplicate parts.

Blount Wet Tool Grinder Finishes Hard Metals

Advanced features have been incorporated in the new Model E wet tool grinder introduced by J. G. Blount Co., Everett, Mass. Smooth operation of the 14-in. wheel permits accurate, fine-edge grinding, particularly on woodworking tools. For metal-cutting tools it will grind many hard metals, special alloys and tungsten carbide to precision cutting edges it is claimed.

A 1 hp. electric motor is mounted on an adjustable hinged bracket just inside the special ventilated base. There is always a free flow of cooling air through louvres in the front and rear hinged doors. The motor will turn a 14-in. grinding wheel approximately 1700

Production Speeded With Snyder Special Drilling Machine

The Snyder Tool & Engineering Co., 3400 E. Lafayette Ave., Detroit, Mich., has announced a special hydraulic drilling machine for drilling oil holes diagonally through the trunnions of a reduction gear carrier ring. The index mechanism is a combination of hydraulic cylinders operating in conjunction with the Geneva index mechanism. The constant velocity hydraulic cylinders, when actuating the Geneva index mechanism, produce shockless rotation of the fixture table with smooth acceleration and deceleration.

The drill spindles are ball bearing mounted in a two-spindle head and equipped with bushing plates with overhanging guide pins. The two-spindle head is mounted in a hydraulically operated quill and is driven by an electric motor on the inside of the base through V-belts and splined shafting. In addition to other provision for maintaining accurate alignment of the small drills through the bushing plates, a pair of rectangular guide bars are also employed.

After loading and manually clamping the workpiece the cycle is started and the machine proceeds through 20 indexes, completing the work. The work cycle of the machine is semi-automatic. The electric control mechanism mounted at the left rear of the drilling machine includes a dial which shows the operator at which part of the cycle of 20 indexes the machine is operating. In case of tool breakage or where an extremely dull tool is used the machine will shut itself off automatically. After replacing the defective tool the operator can finish the part where it was interrupted. The operation consists of drilling 40 holes, 0.078 in diameter, two holes in each pass in the automatic indexing fixture which indexes 20 times. The holes are drilled to a certain depth and then redrilled to a greater depth. The time cycle for the entire operation is six minutes. The automatic indexing greatly reduces handling and the hydraulic tool feed gives uniform rate of feed and longer tool life.

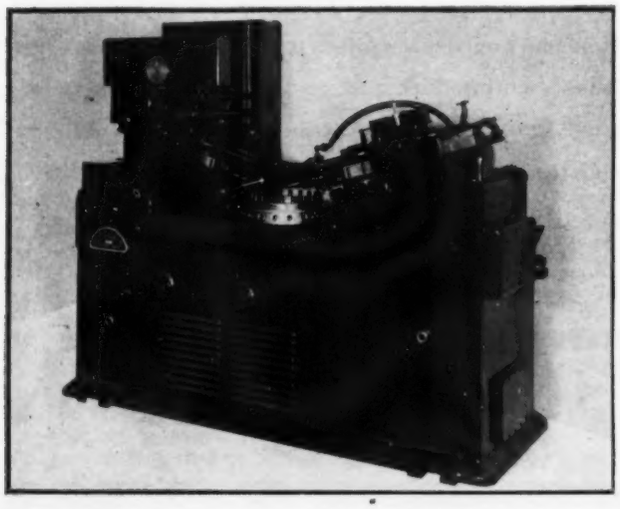
Bee Line Shaft Straightener Accommodates Large Work

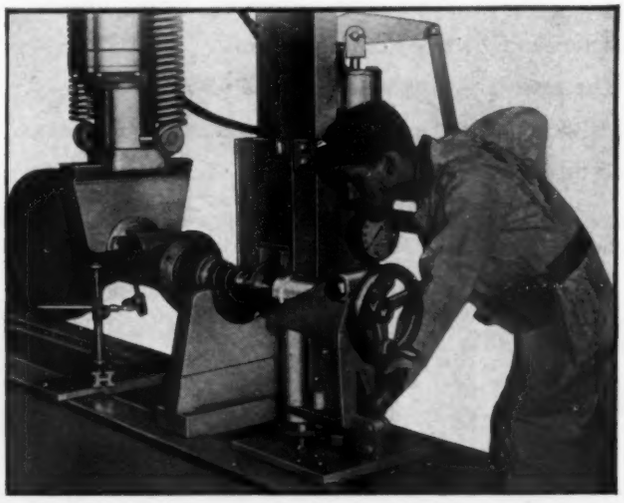
A shaft straightening tool has been introduced by Bee Line Co., Davenport, Iowa, which consists of a pair of work supporting center assemblies, two work supporting fixtures, one flat and one round pressure tool, a surface plate, universal dial indicator for precision measuring and an assortment of half-round spacers for shaft diameters up to 6½ in.

Loads up to 1,000 lb. can be supported on the center assemblies which are heavy duty precision type with preloaded spring construction. During bending or pressing operations the centers deflect with the work and return to the original gaging position as soon as the pressure is released. Work up to 8 ft. long can be accommodated in the centers when used with a 10-ft. press bed, and the height above the bed is sufficient for work having an enlarged portion 22 in. in diameter.

The two work supporting fixtures may be spaced on the press bed according to the length of bend required. For flat surface work the flat top supports are used, and for round work the half-round type is used. For smaller work the half-round spacers are used until an approximate oversize fit is obtained. The half-round pressure tool, connected to the press ram, is used in the same manner except that the half-round spacers are placed on top of the work.

The surface plate rests on the press bed and is used as a sliding base for the dial indicator while gaging trueness of the work which is revolved on the centers to obtain a total reading.





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FROM AN ORIGINAL DRAWING BY ORISON MACPHERSON

STEEL MEN USE SCRAP FOR MAXIMUM WAR-STEEL PRODUCTION

Like coast artillerymen in action with huge railway guns, skilled steelworkers maneuver their hundred-ton charging machines on tracks up and down the batteries of open-hearth furnaces, charging load after load of scrap metal into the seething cauldrons to make strong, fighting steels. Millions of tons of steel scrap are required to keep these war furnaces going twenty-four hours a day, seven days a week.

In adjoining mill yards trained scrap-men load the charging boxes — rush them up to the charging line. Steel scrap, and plenty of it, is vital to making quality battle-steels at a record breaking pace. In the open-hearth operation scrap quickens the process — makes possible efficient use of the natural resources, iron ore, coking-coal and limestone.

Helping men of steel to obtain scrap now for their war furnaces enlists every industry and business — every farmer and householder. It partners everyone with the steel workers who are fighting this war with their skill and will-to-do.

CONTROLLED QUALITY WAR STEEL

JONES & LAUGHLIN STEEL CORPORATION

PITTSBURGH, PENNSYLVANIA

PARTNER TO INDUSTRY IN WAR PRODUCTION

J&L STEEL

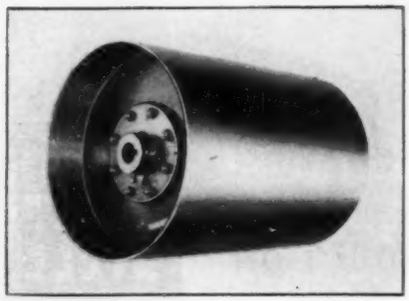
r.p.m. Speed in wheel change is made possible by simply removing the cover on the wheel side, unscrewing a nut and removing loose flange. The new type wheel bearing or pillow block in the machine has been designed for long wear. Garlock oil seals are located on the inside of each bearing cap which prevent oil from leaking out and abrasive from sifting in.

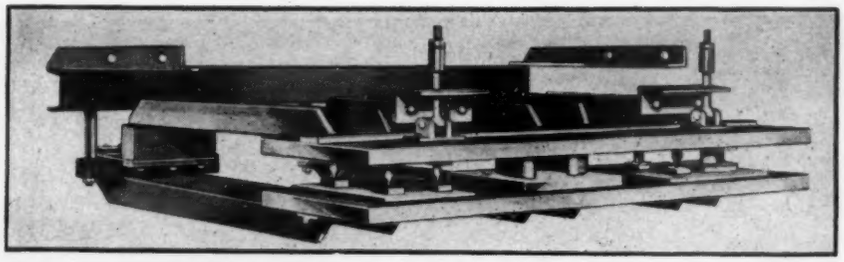
A combination tool rest and dresser is permanently located in front of the wheel and ready for use at all times. A slide is provided through this rest that carries a large wheel dresser which is moved across the face of the wheel for truing.

Strong webbed, heavy cross-sections and smooth round corners of castings provide for rigid and vibrationless grinding operations. The dimensions of the base of the machine are 24×23 in. and the height from floor to center of spindle is 37 in., to top edge of pan it is 33½ in. and to center of wheel it is 8 in. The weight is 740 lb. complete without motor.

American Type N Pulley Has Tight-End Protection

The Type N conveyor pulley announced by American Pulley Co., Philadelphia, Pa., is light in weight and practically unbreakable and is made with tight ends so that no dust or water can accumulate inside. Quick and easy mounting is assured by removable, interchangeable hubs. These tight-end pulleys available in dia's 6 to 36 inches.





Leslie Universal Die Sets Permit Large Stampings

A universal die set has been developed by Leslie Welding Co., 2943 Carroll Ave., Chicago, Ill., to provide an efficient means of producing very large stampings by means of a press brake, such as 20 ft. sections of airplane wings. In addition to handling work of almost unlimited length and throat depth this set is claimed to give accurate die alignment without cumbersome and expensive leader pin die sets. Screws and dowels for attaching punch plates and dies to the punch holders and die shoes are readily accessible so that individual punch and die assemblies may be removed for repair or change without disturbing the remainder of the set-up. The Leslie die set can be produced as needed in almost any toolroom from ordinary steel plates and shapes and is designed for press brake use without lateral or torsional strains on the press brake. Less skilled operators can safely and continuously operate the equipment, which has the advantage of relieving the skilled workers for more exacting work.

GE Fluorescent Fixture Circuit Includes Special Control Unit

Announcement has been made by General Electric Co., Nela Park, Cleveland, Ohio, of a circuit for fluorescent lighting fixtures and a specially designed ballast control unit. The circuit requires the use of only one ballast with

four 100-watt fluorescent lamps. The two lamps on each phase of the circuit start in sequence and operate in series. Thus one ballast does the work of two. The unit saves nearly 50 percent on critical materials, it is claimed, and reduces fixture cost considerably.

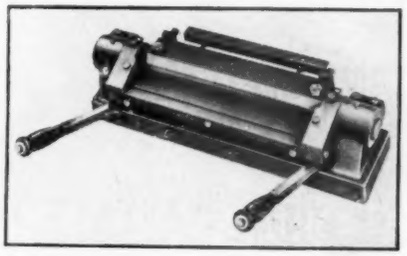
Westinghouse Blackout Bulb Gives Faint Orange Glow

A blackout bulb which may be burned for emergency lighting without the need for window shades or blinds has been brought out by the Westinghouse Electric & Mfg. Co., Lamp Div., Bloomfield, N. J. The bulb gives a faint glow of orange light which is sufficiently clear for distinguishing objects in a room without being visible from the air even though placed directly in line with an open window. It resembles the household light bulb in appearance and is coated with an outer covering of black except for an orange-red opening through which a narrow beam of light passes. The bulb is operated at 15 watts and provides emergency lighting for an area approximately 200 sq.ft.

O'Neil-Irwin Improves No. 2 Di-Acro Bender and Brake

Announcement of improvements in the No. 2 Di-Acro bender and brake has been made by O'Neil-Irwin Mfg. Co., Minneapolis, Minn. Changes and improvements include increased weight and greater rigidity, ease of operation and higher material output. Greater contact surfaces are offered as well as additional provisions for removing the surfaces for changes and alterations quickly which are necessary for a wide variety of forming without dies. Opportunities for economical forming and duplicating without delay in time and preparation expense of special die sets and dies are provided in the broadened operating range.

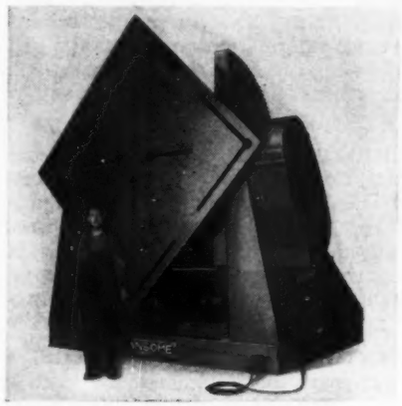
The Di-Acro bender is suitable for forming all kinds of round and irregu-



lar shaped tubes and flat materials required for aircraft and marine construction, while the Di-Acro brake is widely used for forming various types of special materials and synthetics as well as dielectrics and other substitutes required in instrument, optical and photographic manufacture.

Ransome Welding Positioner Takes 22½ Ton Maximum Load

A maximum load of 22½ tons can be handled in the 20-ton heavy duty welding positioner brought out by Ransome Concrete Machinery Co., Industrial Div., Dunellen, N. J., with a center of gravity up to 12 in. above the table top. The table top which is 84 in. square is reinforced by ribs on the



under side and provided with four radial and four longitudinal T-slots for readily attaching the work to the table surface. The table rotates a full 360 deg. at a speed of 1/3 r.p.m. in either direction. A remote push button control station controls the operation. The load is uniformly tilted, even when an unbalanced load is being handled, by means of two tilting gear segments. Separate driving motors are provided so that tilting and rotating may be accomplished simultaneously.

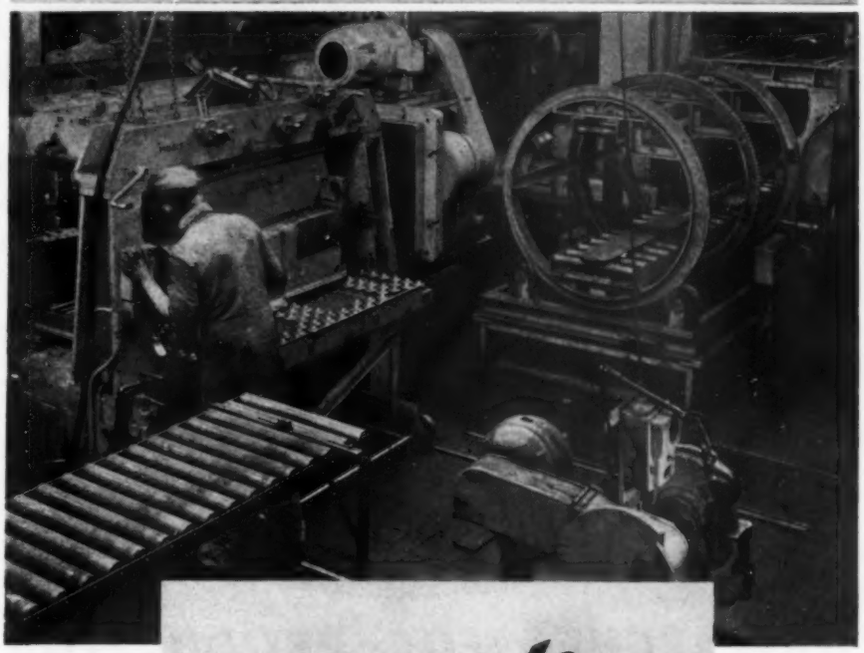
TRADE PUBLICATIONS

SPRAY PAINTING A request on your company's letterhead to Binks Mfg. Co., 3114-40 Carroll Ave., Chicago, Ill., will bring Catalog No. 80, showing everything necessary for successful spray painting and finishing.

METALS Bulletin No. 334, "The Effect of Range of Stress on the Fatigue Strength of Metals," by James O. Smith, has been issued by the Engineering Experiment Station of the University of Illinois, Urbana, Ill.

WELD UNITS A four-page technical bulletin, No. 1300, describing the "Revers-O-Charge" capacitor weld units

MATHEWS CONVEYERS FOR MECHANIZED HANDLING



Speeding THE TOOLS OF Victory

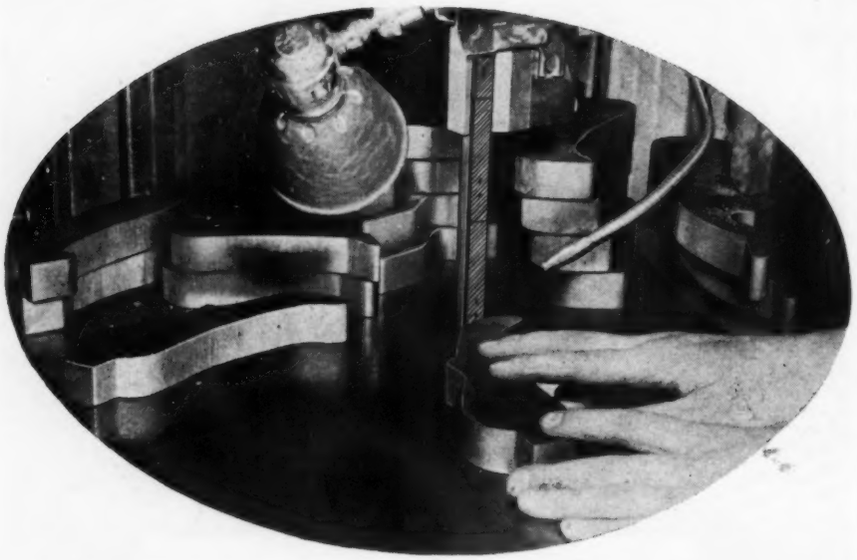
● TIME WAS NEVER MORE PRECIOUS than in this national emergency. Every step that can be saved . . . every unnecessary motion that can be eliminated . . . every ounce of energy that can be conserved helps to speed the tools of victory.

Keeping munitions, materials, and machinery supplies moving faster and with less worker fatigue is the function of Mathews Conveyer Systems.

Mathews engineers have helped hundreds of manufacturers of war material speed up production schedules with no increase in man-and-machine hours!

If you are manufacturing war material, or anything vital to the success of the war effort, you can get Mathews Conveyers to handle that material. Rely as usual on your Mathews Engineer.
MATHEWS CONVEYER CO.
Ellwood City, Penna.

DoAll ★ ★ ★ BAND FILES



UNMATCHED FOR PRODUCTION FILING

Scientifically designed from special steel, these better band files offer a sure, easy way to slash filing time records in plants everywhere.

It's the steady, even, one-way travel of DoAll Band Files that gives such smooth, superior performance.

Above Rachet Pawls for dial feeds, cut from 3140 steel 1" to 2" thick, are being filed in 1/8 the time it would take by hand, 1/5 that of a jig file.

Many Styles

There is a width, cut and style DoAll File Band to finish anything from high carbon steel to hard rubber.

Write today for interesting Booklet on Filing

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1210 Thacker St. **Des Plaines, Ill.**

Associated with Continental Machines, Inc.
Minneapolis, Minn.

and presenting a schematic diagram of the new condenser discharge circuit is available from Weltronic Corp., 3051 East Outer Drive, Detroit, Mich.

MAINTENANCE A digest of 28 essential maintenance jobs generally performed in factories and mills is offered by Oakite Products, Inc., 22 Thames St., New York, N. Y.

LIVE CENTERS A four-page folder issued by Sturdimatic Tool Co., 5220 Third Ave., Detroit, Mich., illustrates and describes live centers for lathes, grinders, milling machines and screw machines.

PYROMETERS Catalog No. 1105, a 39-page catalog of the Brown Instrument Co., Wayne and Roberts Aves., Philadelphia, Pa., presents clear and concise information on the design and operating features of potentiometer pyrometer and accessory equipment.

LIGHTING The Benjamin Electric Mfg. Co., Des Plains, Ill., offers "Specifications for Productive Lighting in War Plants," designed to provide latest information on the best methods of using fluorescent and incandescent lighting economically and efficiently.

SYNTHETIC RUBBER SPONGE A four-page illustrated catalog section containing a table comparing the property relation of Ameripol synthetic rubber and natural rubber sponge is offered by The B. F. Goodrich Co., Akron, Ohio.

WELDING POSITIONERS Bulletin No. 200, illustrating and describing welding positioners, is offered by Ransome Concrete Machinery Co., Dunellen, N. J.

TUNGSTEN ELECTRODES Bulletin W-421, issued by Vascoloy-Ramet Corp., North Chicago, Ill., gives complete information on pure tungsten electrodes for atomic hydrogen welding.

STAMPS Jas. H. Matthews & Co., 3942 Forbes St., Pittsburgh, Pa., has issued supplement A to catalog No. 146, which illustrates and describes steel stamps and type holders for every stamping need.

WIRING DEVICES Bulletin 11, issued by Aircraft-Marine Products, Inc., 286 North Broad St., Elizabeth, N. J., describes Midget solderless wiring devices approved for aircraft, marine, communications and commercial use.

TIN Publication No. 109 of the Tin Research Institute, controlled by the International Tin Research and Development Council, is the report for 1941 summarizing recent researches and developments in the uses of tin in

industry. Copies may be obtained from Tin Research Institute, Fraser Rd., Greenford, Middlesex, England, or from Battelle Memorial Institute, 505 King Ave., Columbus, Ohio.

TOOL BRAZING Handy & Harman, 82 Fulton St., New York, N. Y., has issued a bulletin on the subject of tool brazing and repair entitled "Low Temperature Brazing News."

LIVE CENTERS A four-page folder issued by Ideal Commutator Dresser Co., 1277 Park Ave., Sycamore, Ill., outlines eight ways to speed up production.

PLANERS No. 110, a 24-page illustrated catalog of Cincinnati Hypro openside planers ranging in size from 36 in. to 120 in. is offered by The Cincinnati Planer Co., Cincinnati, Ohio.

AUTOMOBILE TRANSPORTATION Pamphlet No. 37, "Automobile Transportation in the War Effort," by Charles L. Dearing, is published by The Brookings Institution, Washington, D. C., price 25 cents per copy.

GRINDING WHEELS The Norton Co., Worcester, Mass., has issued a folder entitled "Boost Production on Your O. D. Grinding Jobs—Centerless and Cylindrical" which illustrates and describes the "B-E" bond wheel.

METAL "Houghton Products for the Metal Industries" is a 31-page illustrated booklet issued by E. F. Houghton & Co., 303 West Lehigh Ave., Philadelphia, Pa.

FURNACE Features of the Super-Cyclone furnace are illustrated and described in the folder prepared by Lindberg Engineering Co., 2458 Hubbard St., Chicago, Ill.

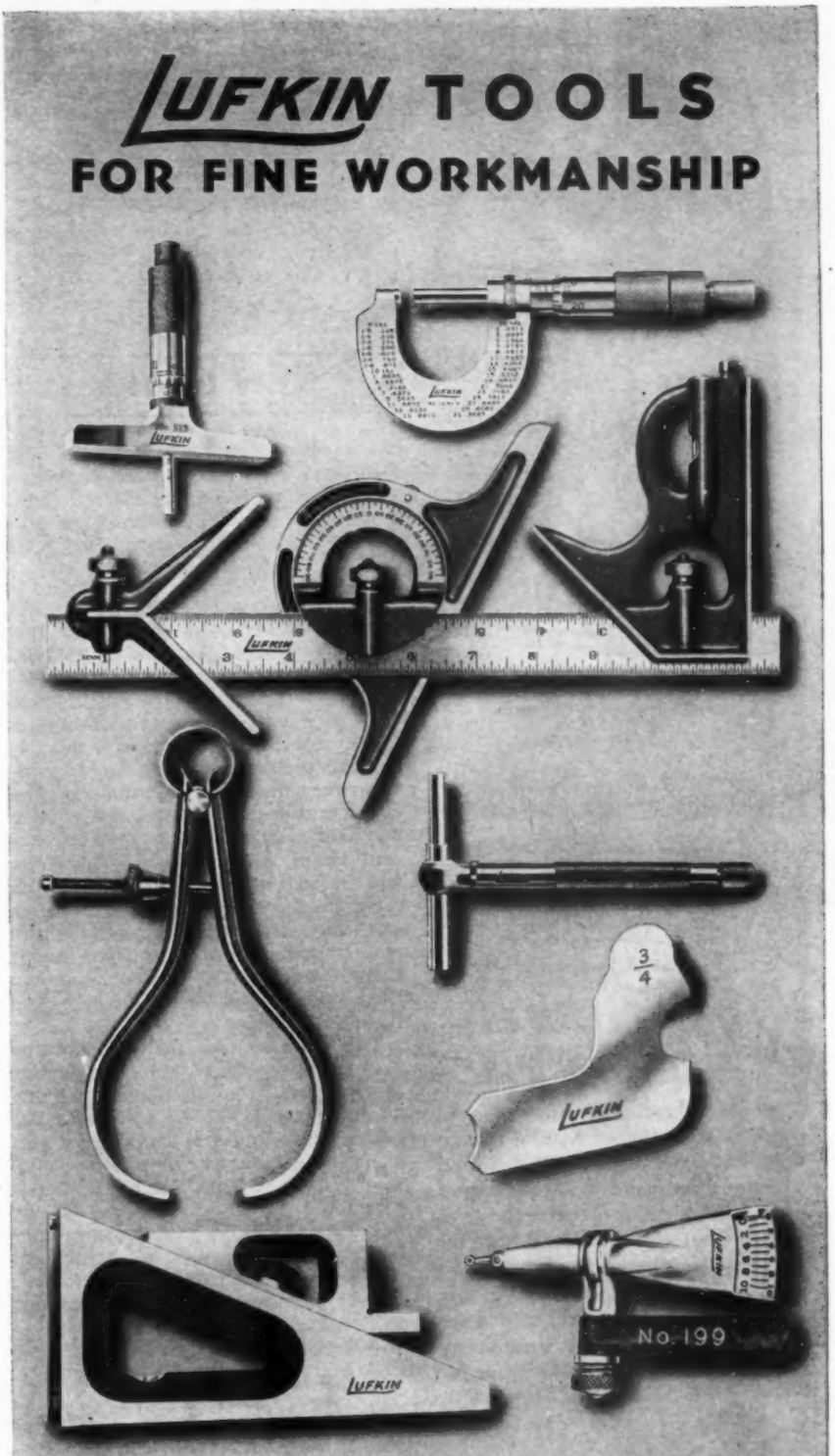
FILTER EQUIPMENT Alsop Engineering Corp., Milldale, Conn., has prepared a 16-page illustrated catalog, No. 242, describing Hy-Speed filter equipment and filter sheets.

BALL BEARINGS New Departure, Division General Motors Corp., Bristol, Conn., offers New Departure Engineering Service, Part Two, "Details of Design of Shafts and Housings for Ball Bearings."

COWL FASTENERS Catalog AD-1, a 26-page illustrated booklet of engineering and procurement data on cowl fasteners is offered by Aviation Division, Shakeproof, Inc., 2501 North Keeler Ave., Chicago, Ill.

EFFICIENCY Copies of "Plant Efficiency—Ideas and Suggestions on Increasing Efficiency in Smaller Plants" may be obtained from regional and local offices of the War Production Board; from local offices of the Divi-

LUFKIN TOOLS
FOR FINE WORKMANSHIP



There's something about Lufkin Precision Tools that appeals to mechanics who take real pride in their work. Perhaps it has its roots in the downright good workmanship that's put into them in the first place. At any rate—it isn't hard to find—and your dealer will be glad to show you.

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THE rapidly increasing use of carbide and other high speed tools emphasizes the immediate importance of this original type of cutting fluid. STUART'S SOLVOL Liquid Cutting Compound was developed especially for this exact condition. Where operations run "too hot" for properly applied straight cutting oils — and where ordinary soluble cutting oils or soluble paste compounds fail to produce satisfactory finish or tool life—that's the place for this original Stuart Oil development.

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WIRE TODAY for working sample—FREE to any industrial concern working on defense orders. To assure proper application please tell us name of part, stock, machine and cutting operations.

For All Cutting Fluid Problems

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sion of Information, Office for Emergency Management; or from Division of Information, Office for Emergency Management, Washington, D. C.

PICKLING "Modern Pickling of Iron and Steel" is the title of a 12-page booklet published by The Enthone Co., 442 Elm St., New Haven, Conn., describing the Acid Addition Agent, to be used in both cold hydrochloric and hot sulphuric acid pickles.

NEW BOOKS

FLOURESCENT LIGHTING MANUAL — *By Charles L. Amick, Nela Park Engineering Department, General Electric Company. 312 pages. Published by McGraw-Hill Book Company, 330 West 42nd St., New York, N. Y. $3.*

Written in layman's language so that nearly everyone, whether he has had much electrical background or not, can gain practical information on fluorescent lighting, this manual was prepared to provide a ready reference source for fundamental knowledge useful in solving the problems which arise in contemporary fluorescent lighting practice.

The author discusses the construction and performance of all types of fluorescent lamps, and covers the principles and methods of calculating illuminating requirements and designing luminaires and installations. It includes helpful pointers on how to install the lamps themselves, how to assure maximum light output, and how to locate and remedy trouble, if any.

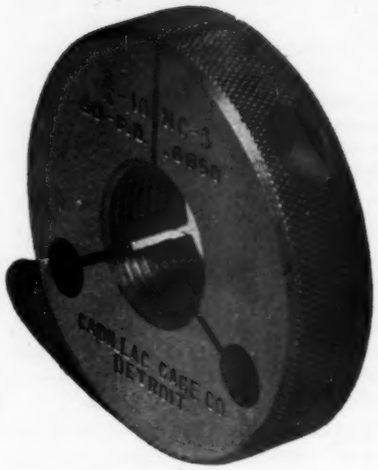
This manual also includes working data, comparisons of economic factors of fluorescent and incandescent lighting, and other aids in the designing, selling, installing and servicing of efficient and satisfactory fluorescent lighting systems. The author also has attempted to interpret some of the basic philosophy of illuminating engineering with regard to footcandle standards and lighting quality for the benefit of those readers whose interest in lighting is of fairly recent origin.

o

SHEET-METAL PATTERN DRAFTING — *By Frank J. O'Rourke, instructor in sheet-metal pattern drafting, University Extension Division, State Teachers College, Fitchburg, Mass. 189 pages. Published by the McGraw-Hill Book Company, 330 West 42nd St., New York, N. Y. $2.*

Sheet-metal drafting has attained in recent years unusual importance, largely because of the changes in construction materials for airplanes. These changes have been largely in the substitution of metal for wood in the fuselage. Consequently, sheet-metal mechanics with considerable skill at practical work are at a disadvantage if they lack the technical education to make

FOR *accuracy* CADILLAC THREAD RING GAGES



AS specialists, we manufacture thread plug and ring gages for checking National, Whitworth and special form threads from your smallest size requirements to six inches in diameter. Special thread checking fixtures and thread alignment gages are built to customer's design. Orders and re-orders from the largest armament manufacturers testify to the accuracy of CADILLAC Gages. *Let us serve you!!*

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THREAD PLUG AND RING GAGES

AND OTHER THREAD CHECKING EQUIPMENT

Cadillac OF DETROIT

them proficient in sheet-metal pattern drafting. The application of the methods explained in this book, which includes detail instructions for laying out and designing all types of sheet-metal shapes and templets, will enable the practical mechanic to shorten and simplify otherwise tedious designs in sheet-metal work.

Special attention is given throughout the book to the fundamental principles that underlie the current methods of sheet-metal drafting. The book is complete with typical examples in sheet-metal layout. The accurate development of the size and shape of many surfaces is explained in detail by parallel-line, radial-line, and triangulation methods used commonly for obtaining such developments.

•

TRADE AND JOB ANALYSIS—*By Verne C. Fryklund, associate professor of industrial education, University of Minnesota, Minneapolis, Minn.* 167 *pages. Published by the Bruce Publishing Company, Milwaukee, Wis.* $1.75.

This book has been prepared for teachers and persons in training to become teachers. Basically, it is a comprehensive plan for analyzing problems involved in teaching a trade or job to workmen in all types of occupations. In such teaching, the author assumes that there is a similarity of subject-matter organization quite like that of mathematics, wherein fundamental elements must be identified and taught. Then these elements can be applied in typical problems which might arise in various training situations.

The general material in the text includes an analysis of education for industry; how to anaylze specific jobs so that they may be taught easily. The author develops a technique by means of which the essential elements of an occupation are identified and listed for instructional purposes. It includes the taking of an inventory of the elements to be taught, and how these elements can be applied specifically to individual teaching courses in a large variety of trades and occupations. By comparisons drawn from familiar trades and occupations, by ample definition of terms, and by illustrative charts, the author clarifies all phases of trade and job analysis.

•

14,000 GEAR RATIOS—*By Ray M. Page.* 404 *pages. Published by The Industrial Press,* 148 *Lafayette St., New York, N. Y.* $5.

This book tabulates 14,280 two-gear combinations and many more possible four-gear combinations, the tables being presented in both common, fractional and decimal forms. The first part of the book is given over to a discussion of general formulas for gear ratio and speed problems, and gives a number of examples illustrating the application

W-S Standard Reamers with carbide tips. Tapered shank (illustrated) and straight shank types. Sizes: ¼ to 1½.

Today's answer to MORE PRODUCTION

IF you want to step up production as much as six times . . . cut down grinding time . . . and lengthen the service life of cutting tools . . . then switch to W-S cemented carbide tipped tools.

Each one is tipped with the correct grade of CARBOLOY best suited to do a cutting job on the metals for which the tools are ordered. (Other brands of carbide can be specified.)

You can expect and get uniform results with W-S tools. This is assured by our high standards for accuracy and inspection. We *specialize* on cemented carbide tools *exclusively.* For this reason, we list as standard many tools formerly in the "special" class. Prompt shipment from stock on many types. Catalog 142 sent FREE upon request. WENDT-SONIS COMPANY, HANNIBAL, MISSOURI.

Wire or phone your requirements and priority rating.

W-S Carbide Tipped Core Drills available in straight and tapered shanks. Sizes: ½ to 1¼.

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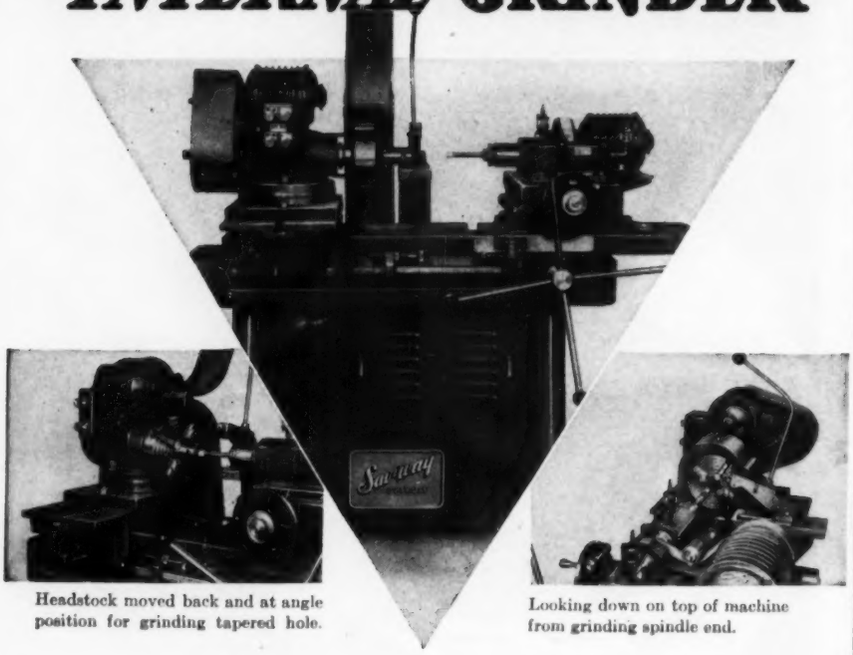
CARBOLOY CUTTING TOOLS

CENTERS ★ FLUTE DRILLS ★ CORE DRILLS ★ COUNTERBORES ★ SPOT FACERS
END MILLS ★ REAMERS ★ HOLLOW MILLS ★ LATHE BITS ★ SPECIAL TOOLS

Saw-way MULTI-PURPOSE INTERNAL GRINDER



Headstock moved back and at angle position for grinding tapered hole.

Looking down on top of machine from grinding spindle end.

Offers greater flexibility . . . a precision grinder, designed and built by engineers with years of practical experience to guide them . . . has a headstock traverse of 6″ . . . grinds holes ¼″ to 18″ in diameter . . . holes up to 9″ deep, straight or tapered . . . entire headstock may be moved at right angle to wheel traverse, by merely loosening two conveniently located nuts . . . worm compensating device permits grinding wheel head adjustment to .0001 . . . sturdy construction throughout . . . full specifications, delivery time and price on request.

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of the gear ratio tables. The tables include every ratio from 1/120 to 120/2, resulting in 14,280 ratios which start at 0.0083333 and continue to 60.000. These ratios are presented in four sections. Each section is arranged differently to facilitate the solution of all classes of gear-ratio problems. Any ratio within the range of the table may be found quickly; this also is true of any gear combination equivalent to a required ratio.

The first section of tables gives common fractional ratios and their decimal equivalent. This section is composed of 119 separate tables, each complete on one page, with the denominator of the fractional ratio serving as an index. The decimal equivalent has been carried out to eleven places when the ratio is less than 1, and to nine places when the ratio is greater than 1.

The tables in the second section contain in the first column ratios expressed as decimal fractions. All these decimals are arranged in numerical order from the lowest to the highest so that any value in the table can be located readily. The decimals are followed by their logarithms in the second column. The third column contains the ratios expressed as common fractions. When a given ratio has two or more common fraction equivalents, all these are given to facilitate selecting required gear sizes.

Section 3 applies to all gear combinations having tooth numbers up to and including 120, listing in ascending order all total tooth numbers from 25 up to 239. Below each total number are listed all two-gear combinations equivalent to that total. For example, under "37 total teeth" are listed 14 combinations or pairs of driving and driven gears, each of which has a total of 37 teeth. This section is of particular value in selecting "pick-off" or other gears on fixed centers.

The gear factor table in Section 4 consists of all numbers from 20 to 14,400 that are the product of two factors neither of which exceeds 120. This table is useful in finding gear combinations equivalent to a given numerator and denominator, representing a required ratio.

•

JOB TRAINING UNITS—*By the Staff of the Dunwoody Industrial Institute. Published by the American Technical Society, Drexel Ave. at 58 St., Chicago, Ill.* $1.25 *each.*

Three additional units of the Dunwoody machine shop series of job training units have been made available. These cover shaper and planer operations, drill press jobs, and milling machine jobs. These complete a series of six manuals for training on different machine tools—lathes, drill press, milling machine, grinder, shaper and planer, and bench work. The plan of training and the training material have been developed, tested and improved continuously by the staff of the Dunwoody Industrial Institute. By special

arrangement, they also have been tried out with trainees both with the regular and in the pre-employment and supplementary defense courses of other industrial and trade schools.

Each manual consists of a series of shop training jobs, each of which is thoroughly described. In each case, the job instruction sheet is accompanied by a job check sheet on which the student can answer important questions about the particular work he is doing. Photographs of machines and tools, and line drawings showing parts and tool setups, increase the value of these training units materially. In each case, an instructor's guide in the use of the manual has been prepared and is available from the publisher. Each of the manuals is designed for use in the school shop, at the machine, by the student. This work should be accompanied by classroom work on shop mathematics, the theory of the cutting of metals, heat-treating, and other subjects with which the student machine operator should be familiar.

•

AIRCRAFT RIVETING FUNDAMENTALS—*By George E. Tabraham, supervisor of aeronautical activities, Detroit Board of Education.* 31 *pages. Published by the Bruce Publishing Company,* 540 *N. Milwaukee St., Milwaukee, Wis.* $0.50.

This paper-bound instruction book on aircraft riveting consists of four pages of information regarding standard aircraft rivets, and ten instruction projects for the student. These instruction exercises are well outlined, and sufficient line drawings are provided to illustrate the correct and wrong methods of performing the various operations. However, this instruction book would have been of greater value to the student had the author given more space over to a discussion of the problems involved in each of the exercises. Obviously, this book has been prepared to supplement personal instruction in the classroom and the training shop.

SEEN and HEARD

Inspectors or Saboteurs?

Sabotage often goes under the guise of rigid inspection. The fact that no sabotage is intended but is the inevitable result of ignorance or reluctance to assume any responsibility does not help any.

Through ridiculous interpretation of specifications, plus rejection for alleged defects not in the specifications at all, inspectors are greatly delaying the output of a concern that has been noted for its fine workmanship for many years. Parts are rejected for imperfect threads which are used only to guide the workpiece and hold it while being welded. The part would function equally as well with no thread at all.

High polish is demanded on clamping

Keep working areas clear of congestion . . . release men for productive work . . . keep materials and parts moving fast and sure—with Standard power or gravity conveyors.

More than 17 different types of conveying equipment are included in Standard's line—for carrying, lifting, lowering, tiering, and piling, as well as pneumatic tube systems for the swift transmission of orders and papers.

The 76 page booklet, "Conveyors by Standard," will aid to select the best types of power and gravity conveyors to help you keep ahead of your production schedule. Write for Bulletin AM-8.

STANDARD CONVEYOR COMPANY
General Offices: North St. Paul, Minn.
Sales and Service in All Principal Cities

surfaces that would hold better with a rough finish.

All the while vital equipment for our armed forces awaits the completion of parts like these.

Come on up

Most large plants now employ public address systems to locate department heads and other executives who may be wandering around the shop. Their names are called with directions to report to a particular department.

The process of locating these men is speeded up noticeably by having a girl with plenty of oomph in her voice do the announcing. A simple request like "Bill Jones, please come to Department 38" has all the insinuation of Mae West's famous "Why don't you come up to see me sometime?" No male can fail to respond to a call like that.

Testing Interchangeability

Several units of the automobile industry are now manufacturing Pratt & Whitney aircraft engines for our armed forces. Months ago, when it was first suggested that automobile plants could make airplane engines, the question most frequently raised was whether a completely interchangeable precision product could be built in quantity in scattered plants. Recently Pratt & Whitney engineers tested the interchangeability of engines built in its own plant and others built by an important unit of the automobile industry.

The engineers took two twin Wasp engines—one had been built in its own plant—the other in an automotive plant. Each engine had been completely assembled in the plant where it was built, but neither had received the so-called "green test." The engines were torn down, thoroughly inspected, and then parts of the two were interchanged. Every conceivable combination of parts was switched from one engine to the other.

The two engines were then assembled with no special hand fitting and run through the normal "green test." They were torn down again and inspected. Examination of inspection sheets for the two engines showed both to be in normal condition at the completion of the tests. They passed these tests so well that they were reassembled with the interchanged parts still interchanged, and shipped for duty.

Deglamorized Glamor

One difficulty in adjusting women to industry is that fluorescent lights and cosmetics simply do not mix. When lipstick becomes a deep purple and eyeshadow is transformed into circles under the eyes, drugstore glamor flies out the shipping door.

What is needed is a line of fluorescent cosmetics. While this is really outside the metal-working field, we pass the idea along to the chemical industry as a worthy morale-building project.

Wins Test at LOCOMOTIVE SHOP

Another Capewell record was established when Technite power hack saw blades won a test by a wide margin in a large Eastern locomotive shop. Capewell's Technite blades demonstrated longer blade life, faster cutting. How Capewell can cut costs on your job is worth investigating. Order Capewell Technite from your mill supply man.

CAPEWELL

Remember
Pioneer and
Forget
Your Coolant and Lubricant Problems

Today, with every effort being bent toward maximum output—you can afford to take no chances on any equipment that is not dependable.

With Pioneer Pumps on your machines you can forget the cooling and lubricating factors. These pumps have a recognized record for reliability; they require no attention by the operator. The coolant flow is always dependable—right from the moment the machine starts.

Pioneer Pumps are noted for their greater volumes with low power consumption.

With 375 standard types available, there is a Pioneer Pump to meet your particular requirements and bring highest efficiency to your machine operations.

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ENGINEERING & MFG. CO.
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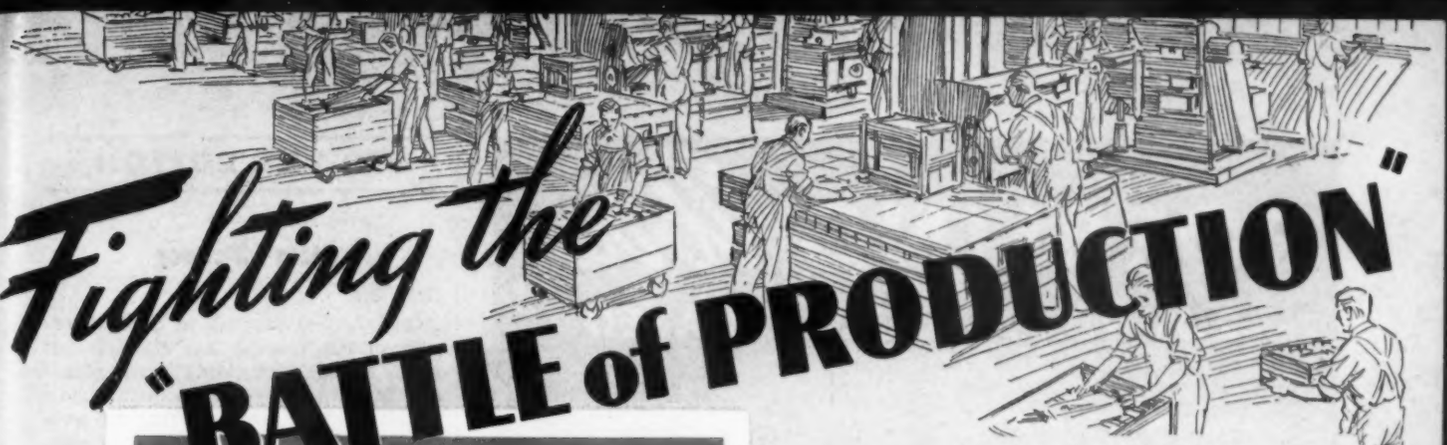

Fighting the "BATTLE of PRODUCTION"

MORE SOLDIERS PILOTS MARINES MEN

Calls for

MORE PLANES SHIPS GUNS SUPPLIES

Production of war materials has been speeded up, doubled and increased beyond peace time's wildest dreams . . . work hours have been lengthened, single working forces increased to two shifts, and in some cases to three shifts, seven days a week.

Machines are being operated many more hours and at a higher speed than ever before . . . several years of wear and depreciation are being crowded into one . . . machines are fighting the "Battle of Production" . . . and are proving themselves masters of the job . . . a tribute to their makers.

Many of these machines producing war materials are air operated and most air operated machines are equipped with Ross Air Control Valves . . . the valves that have been engineered and built to stand up under continuous use and adverse conditions.

Today all of us are in this battle up to our hilts; let's cooperate with each other; because of our more than 16 years of specialized experience in the air control field, permit us to help you get top production out of your air-actuated machines and equipment . . . as true soldiers, let us cooperate with you in fighting this "Battle of Production."

ROSS Operating VALVE CO.
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★ A SIZE AND TYPE FOR EVERY OPERATION ★

ROEBLING Wires
ROUND . . . FLAT . . . SHAPED
A FEW WIRES TYPICAL OF ROEBLING'S BROAD SPECIALTY PRODUCTION
FOR PARTS THAT Must not FAIL!
SHAPED WIRE
HIGH CARBON WIRE FOR MACHINE GUN RIVETS

FOR FAST OFFENSE PRODUCTION of parts that *must not fail,* turn to Roebling for the right round, flat, or shaped wire stock. This high carbon wire for machine gun rivets, made by Roebling's special process, for example, shows our ability to meet unusual and exacting metallurgical and physical specifications, and to produce to standards of uniformity that approach perfection.

Whether your specifications call for close dimensions, unusual shapes, uniform temper or special finish, remember that Roebling has built a reputation solving wire problems, and has the experience and facilities to solve yours. Prompt action on war orders.

JOHN A. ROEBLING'S SONS COMPANY
TRENTON, NEW JERSEY • Branches and Warehouses in Principal Cities

TO THE EDITOR

More Efficiency

Dear Sir:

Our greatest progress in the furtherance of our present war effort is not going to be by building more plants but by using more efficiently the plant we have. The greatest error we have made so far is that we think of production in terms of man-hours rather than in terms of what that man in that hour can do.

When we begin to increase the efficiency of our present operations it will be a very simple thing to double our present production with the same number of man-hours. We can, inside of another few months, double that again if the efficient methods which the industrial geniuses know can be applied and are enthusiastically followed.

As an example of this, in the present building of ships ⅛ in. and 5/32 in. electrodes are largely being used for welding. If these should be changed to 3/16 in. and ¼ in. the speed of welding should be more than doubled. The cost of the electrode also would be reduced, the production of electrode by the same number of man-hours would be increased, and the reliability of the joint would be increased.

The great problem we have is not more welders, more shipyards and more men but more efficiency with what we now have. Man-hours alone will never beat the Axis, as we are seeing. The efficiency possible by the application of industrial genius will.

Yours very truly,
J. F. LINCOLN, *President*
Lincoln Electric Company.

Over-Size Lathe Work

Dear Sir:

The article "Lathe Adapted for Over-Size Work" by Paul C. Wiegandt, (*AM*—Vol. 86, page 445) is of great interest to me—and also a disappointment. The latter because, unless it contains something which does not clearly show in the photograph, the device is of limited usefulness, such as cuts on the rim, or facing cuts on the *wrong* side of the work, on that portion which extends beyond the faceplate.

Like many another operator of a shop in an agricultural community, I cannot afford either the cost or the floor space for a large lathe, and yet there is considerable seasonal demand for repair work on such items as plow and reaper wheels. Practically all of of these need machining on the hubs or in the bore, which would seem to be impossible with Mr. Wiegandt's device.

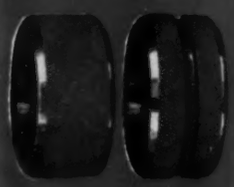
What I hope to see is a discussion in your columns by several oldtime job shop men, telling how they used to "rig-up" for such work.

Very truly yours,
C. M. WARNER

How TO ORDER GAGES

When an order for fixed size gages fails to include complete gage specifications, the missing information must be gotten by further correspondence before the order can be put in production. This delays procurement of these vital tools and it also puts an extra burden on the time of procurement personnel. Both can be prevented by including all the following information on gage orders.

PLAIN PLUGS and RINGS



1 Size (Go and Not Go).

2 Class of gage makers' tolerance.

3 Members desired—Go, Not Go, Handle.

4 Length of member—standard or extra long.

5 If progressive member is wanted, so state.

6 Complete marking instructions.

SNAP GAGES

1 Frame size.

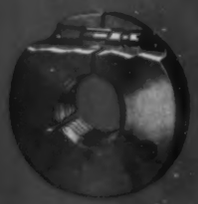
2 Frame model.

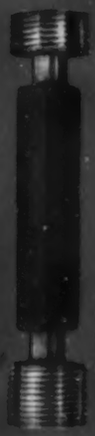
3 Range.

4 Stipulate whether gage is to be set and sealed.

5 Complete marking instructions.

THREAD GAGES





1 Size (Go and Not Go).

2 Threads per inch.

3 Class of fit for the work part.

4 Class of gage makers' tolerance and pitch diameter.

5 Members wanted—Go, Not Go, Handle.

6 Complete marking information.

7 Whether or not a setting plug is to accompany a ring gage.

8 If setting plug is ordered, whether ring gage is to be set and sealed.

It is always strongly recommended and good practice to order a setting plug for every thread ring gage purchased because there is no other good way of accurately checking ring gage wear or of resetting the ring gage to compensate for that wear.

The gage maker does not set and seal a thread ring gage unless he also furnishes a setting plug. He cannot do this because of the three variables involved, pitch diameter, lead, and thread angle. Every one of these is interrelated and every one may vary within its own tolerance zone. Thus, a thread plug and a thread ring made at different times or by different manufacturers may both be well within their tolerance limits in every element and still, because of these small cumulative differences, the two might not fit together precisely. When both the ring and the setting plug are made together, these differences can be adjusted, but not otherwise.

SHEFFIELD GAGES MASTER GAGEMAKERS

THE *SHEFFIELD* CORPORATION

DAYTON, OHIO, U. S. A.

Gas Mask Production Increased 250%

Speeding Mosquito Boat Production, this workman drills holes for bolting frames to gussetts. The tool is a B & D ¼" Shorty Electric Drill.

"Materially Speeding Production," reports marine equipment maker. "Thanks for help setting up new war-production line. Using B & D Stud-Setters, Nut Runners, Drills, Scruguns. Appreciate prompt repair and parts service."

—with Black & Decker Tools!

THROUGHOUT war industry, Black & Decker Portable Electric Tools are pushing production to new peaks. A time study by a gas mask manufacturer shows: Black & Decker Scruguns cut nut-running time per unit from 15 seconds to a fraction over 4 seconds. Time saving, 73%. Production increase, 250%.

Other busy plants report: "Sheet metal cutting time reduced 75%" . . . "Production up at least 30%" . . . "Screw driving speed increased 20%" . . . Drilling and tapping, screw driving and nut running, sawing and sheet metal cutting, grinding and sanding . . . these are some of the countless jobs on which Black & Decker's many types of Portable Electric Tools are saving precious hours now.

Expert Help—QUICKLY!

A Black & Decker Distributor suggested the time-saving operation shown above. On any tooling problem, and as a dependable source of supply, phone your nearby Black & Decker Distributor. Or write The Black & Decker Mfg. Co., 716 Pennsylvania Ave., Towson, Maryland.

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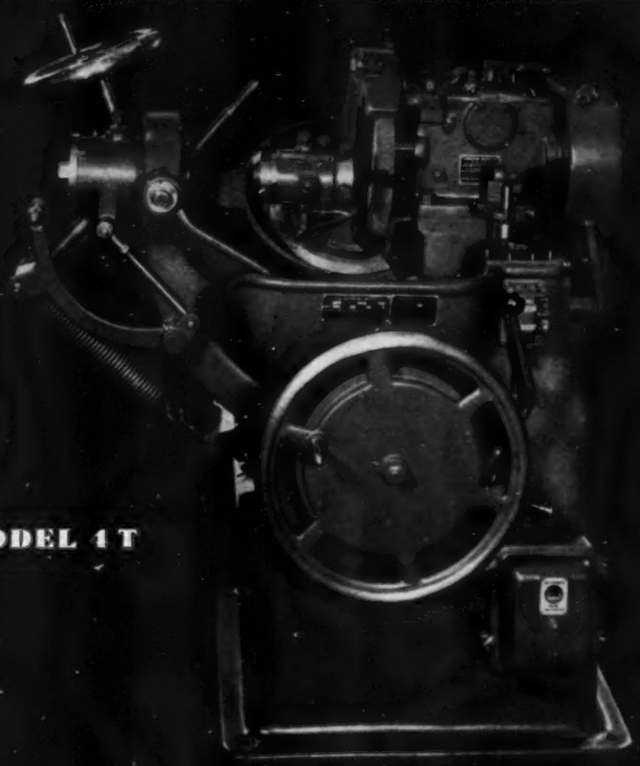
Black & Decker

PORTABLE ELECTRIC TOOLS

Sellers
Tool Grinders

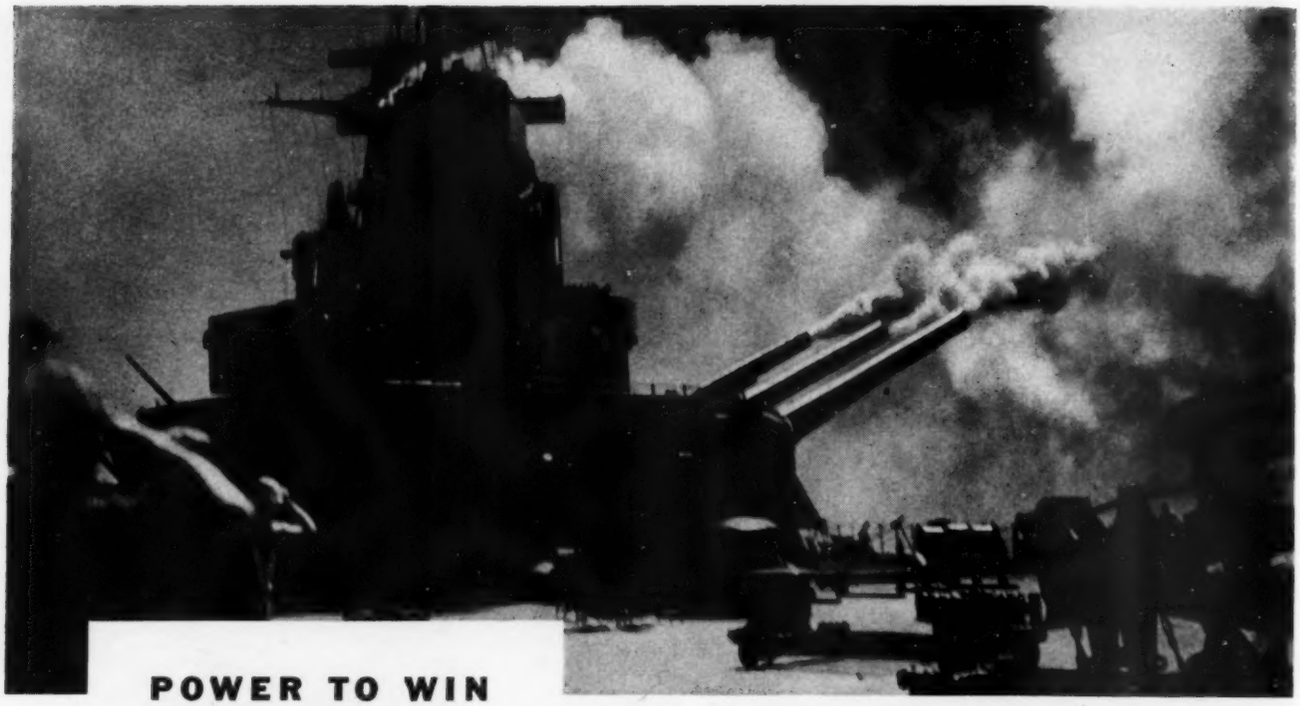


MODEL 4 T

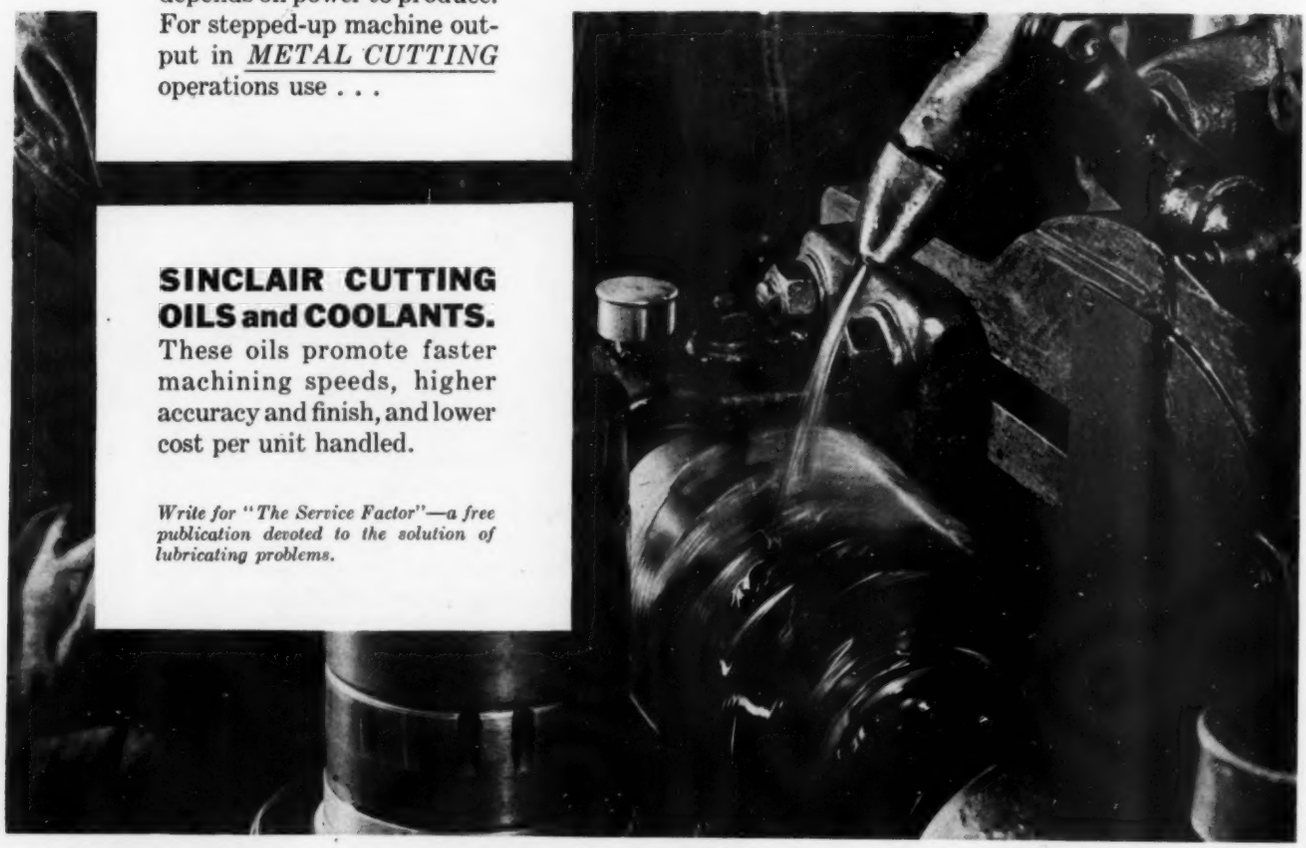
THE GRINDING PRECISION and uniformity of Sellers Tool Grinder is the result of its "line contact" principle of grinding which is accomplished by moving the work up and down in a straight line tangent to the periphery of the grinding wheel and in this way allowing the work to contact the wheel along a line only. The advantages of the Sellers line contact method of tool grinding are many. Proper rake and clearance angles *at the cutting edge* can be quickly and economically obtained and the operation is so simple that a toolroom attendant can easily maintain tools for the whole shop.

WILLIAM SELLERS & CO., Inc., Philadelphia, Pa.

FOUNDED SELLERS 1848



POWER TO WIN
depends on power to produce. For stepped-up machine output in *METAL CUTTING* operations use . . .



SINCLAIR CUTTING OILS and COOLANTS.
These oils promote faster machining speeds, higher accuracy and finish, and lower cost per unit handled.

Write for "The Service Factor"—a free publication devoted to the solution of lubricating problems.

SINCLAIR INDUSTRIAL OILS

FOR FULL INFORMATION OR LUBRICATION COUNSEL WRITE NEAREST SINCLAIR OFFICE

SINCLAIR REFINING COMPANY (Inc.)

2540 West Cermak Road, Chicago • 10 West 51st Street, New York City • Rialto Bldg., Kansas City • 573 West Peachtree Street, Atlanta • Fair Building, Ft. Worth

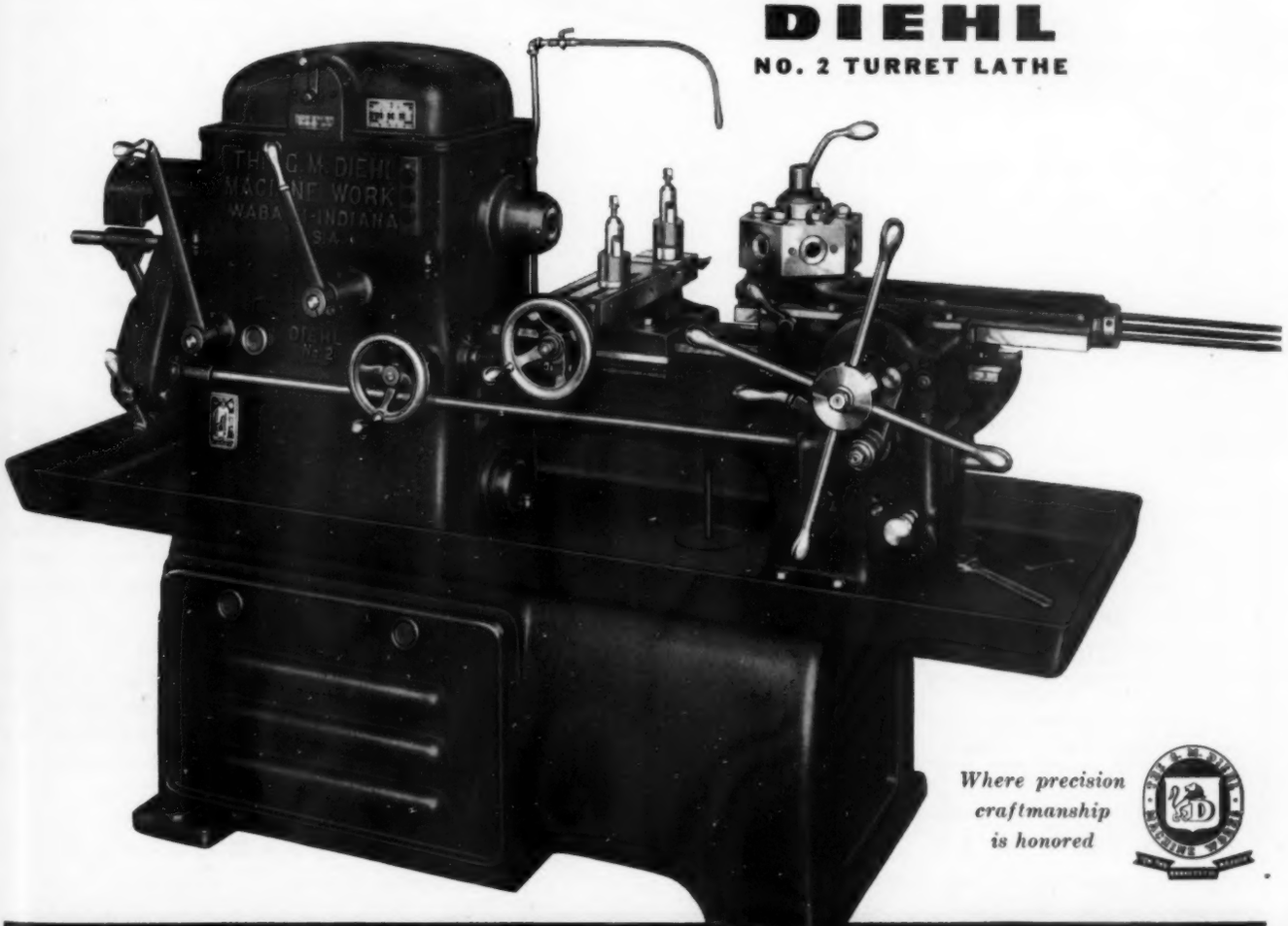
★ DIEHL ★

POWERED for Wartime Production!

The new Diehl Power Feed Model No. 2 Turret Lathe embodies characteristics that make it ideal for shops busy on war contracts. It is backed by a name that is outstanding in the field of heavy wood-working machinery, and is the result of years of designing and producing quality precision machinery. Because of today's pressing need for turret lathes in war industries, the Diehl name is appearing in the metal working field. We are sure that it will be sustained by the performance of our product. The Diehl Power Feed Model works alongside any other No. 2 Turret Lathe of standard make, using same tooling, including collets. Automatic chuck capacity (round)—1″; swing—over cross slide, 6″, over bed, 14″. Six speeds, forward and reverse. For complete details write for brochure.

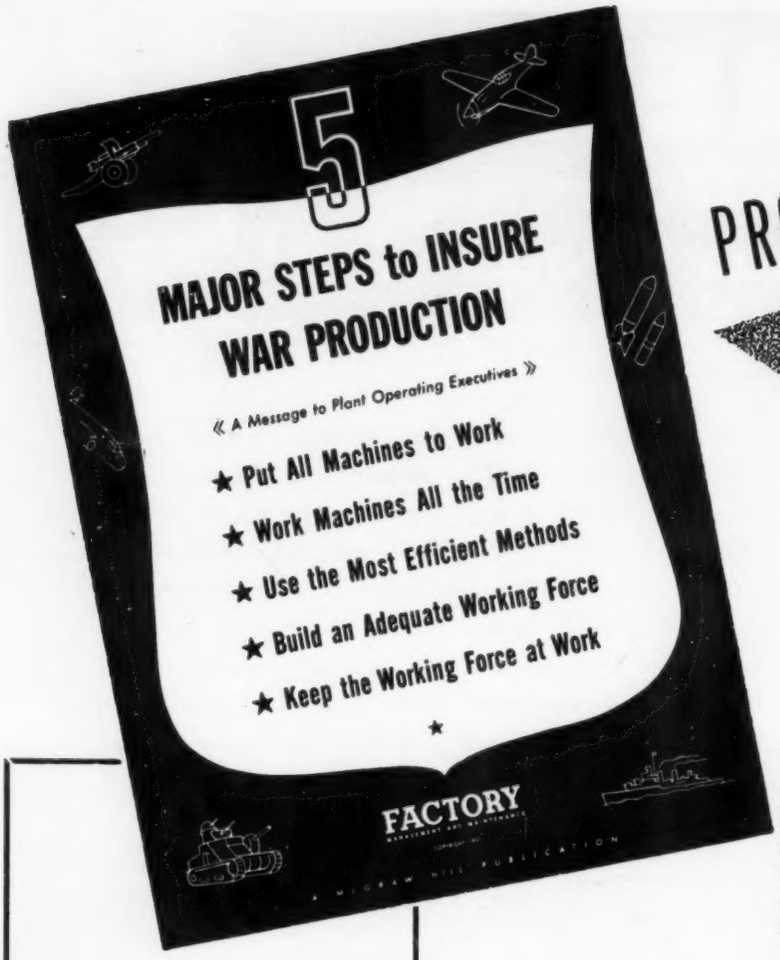
DIEHL

NO. 2 TURRET LATHE



Where precision craftmanship is honored

The G. M. DIEHL MACHINE WORKS Wabash, Indiana


5
MAJOR STEPS to INSURE WAR PRODUCTION
« A Message to Plant Operating Executives »
★ Put All Machines to Work
★ Work Machines All the Time
★ Use the Most Efficient Methods
★ Build an Adequate Working Force
★ Keep the Working Force at Work
★
FACTORY

McCASKEY PRODUCTION CONTROL

HELPS PUT ALL MACHINES TO WORK ALL THE TIME . . .

The scheduling of machines for maximum production is particularly difficult today. Difficult, but of extreme importance. Schedules frequently must be changed because of priority requirements, material and tool shortage, and other unexpected developments. McCaskey Machine Control readily meets these severe demands.

The jobs running and additional jobs scheduled to each machine, the production hours they represent, the date to which each machine is loaded and other essential information are made available almost at a glance with very little clerical work. Effective planning of departmental production is the natural result, enforcing production in the sequence necessary for assembly requirements and shipping schedules.

The procedure is so simple that it is easily and quickly installed in the busiest plants. It is used with equal success for the control of single machines or groups of similar machines; individuals or crews; production, assembly or maintenance. First cost and operating expense are surprisingly low.

Equipment and procedure are illustrated and detailed in bulletins available promptly on request. Experienced plant men will call to discuss your requirements and offer recommendations without obligation. Write today.

REPORTS FROM PLANTS USING
McCASKEY PRODUCTION CONTROL SYSTEMS . . . .

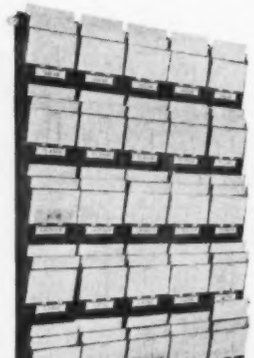
The following from a well-known Detroit manufacturer is typical of many other reports of specific advantages resulting from the use of McCaskey Control . . .

"Scheduling from one to ten jobs a day to 170 machines involved frequent headaches until McCaskey Machine Control was adopted in the spring of 1937. The parts for seven divisions (of this company) are machined in this plant. Under normal conditions, rush orders from several divisions invariably are demanding special attention in addition to the usual flow of production. Delivery dates often are difficult to meet—or were, before McCaskey methods simplified the problem.

"We can now determine at a glance the total hours of work on hand for each machine. Jobs are scheduled so that machines are loaded evenly and used most advantageously. Delivery dates are met and precedent is readily given to rush jobs.

"When production volume is at a peak, reference to the work on hand for each machine quickly indicates the shifts required to clear it up without delay.

"These results have been secured with a minimum of clerical work and with a surprisingly small original investment. McCaskey Control has been most satisfactory to us."



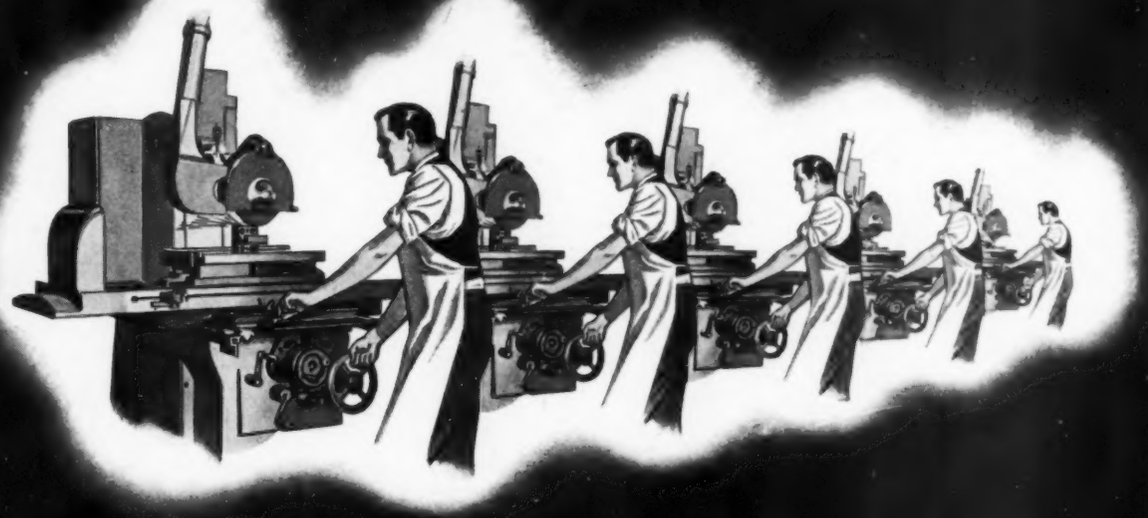
THE McCASKEY REGISTER COMPANY, ALLIANCE, OHIO

McCaskey Systems, Ltd., Galt, Ontario, Canada. *The McCaskey Register Co., Waterford, England.*

McCASKEY INDUSTRIAL CONTROLS

PRODUCTION • INVENTORY • MAINTENANCE • TOOLS • COSTS • PAYROLL

2 TO 5 TIMES
MORE PRODUCTION PER MAN PER MACHINE



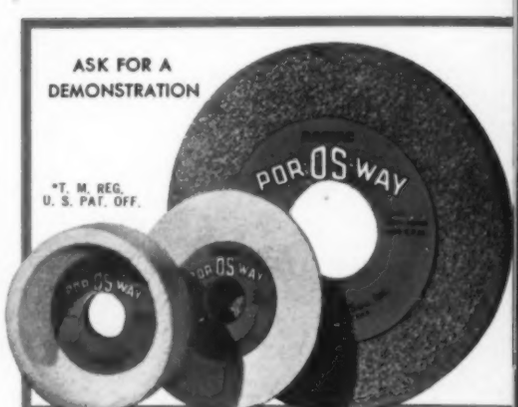
Courage to try a new Grinding Wheel may solve your labor and machine shortage now

AT THIS CRITICAL TIME in war production, Radiac comes to your aid with a new type of precision grinding wheel. This new wheel, called Por-os-way, is different from any wheel you have ever tried before.

Properly used it takes deeper cuts, breezing through .010" or more. It grinds 100 to 400% faster, increasing production per man per machine 2 to 5 times. But that's not all. Por-os-way shows little tendency to load or burn the work. Here's the reason. Por-os-way is made by a new patented process. The structure, instead of being "sandy" and compact is "stringy" and porous—something like a sponge. Millions of air cells allow the air to keep every grinding contact cool. Yet Por-os-way is hard, tough, holds the corner and requires very little dressing—due to a new vitrified bond.

Por-os-way grinds hard alloys with ease; copper, aluminum, wood, rubber, plastics and other soft materials with minimum loading. See this wheel. Try it and learn how much faster and cooler it grinds. Write today for a trial demonstration on your machines. A. P. DE SANNO & SON, INC., 430 Wheatland Street, PHOENIXVILLE, PENNSYLVANIA.

POR-OS-WAY* *a new* **RADIAC* PRODUCT**



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AN AMAZING NEW GRINDING WHEEL—

TRIPLE TEST

PROVES IT COOLER, FREE-CUTTING, 2 TO 5 TIMES FASTER

1 MAKE THE SMOKE TEST

Put your lips to a Por-os-way wheel and blow. Watch the smoke stream through the millions of large air cells, air cells that cool each tiny grinding point.

2 MAKE THE LIGHT TEST

Hold a Por-os-way wheel up to a light bulb. Note the even spread of light. No soft spots to wear quickly, no hard spots to glaze. Uniform structure of the wheel gives you uniform wear.

TRY THE POR-OS-WAY WHEEL

Take your regular cut with the Por-os-way wheel. See how easy this wheel is on the spindle, how much faster it grinds—without vibration. Double or triple your regular cut and don't worry because this wheel rarely burns work. Try the Por-os-way wheel on hard alloys as well as on brass, wood, plastics or other soft materials and note how it reduces loading to a minimum. Write for a demonstration.

3 MAKE THE GRINDING TEST

And don't spare the wheel. The new vitrified bond stands up to the toughest steels and holds its corner.

POR-OS-WAY* *a new* RADIAC* PRODUCT

*T. M. REG. U. S. PAT. OFF.

A. P. DE SANNO & SON, INC., 430 Wheatland Street, PHOENIXVILLE, PENNA. • SINCE 1883

Offices and Warehouses in New York City, Pittsburgh, Cleveland, Detroit, Chicago, Los Angeles

FEDERAL SHELL GAGES

Shells, give them more — but accurate ones. Help make sure that every shell goes true to its mark by precision inspection.

CONCENTRICITY INSPECTION:—Shells whose diameters are all concentric will not wabble off their course. And, a Federal Concentricity Gage will inspect both inside and outside diameters *simultaneously*.

DIAMETER INSPECTION: — Any number of outside diameters can be inspected *independently* of each other yet simultaneously on a Federal Diameter Gage.

No shell is true unless it is inspected for Concentricity and also for Diameter. They are two *different* types of inspection. Write for Shell Dial Indicator Gage folder.

FEDERAL PRODUCTS CORPORATION
1144 EDDY STREET — PROVIDENCE, R. I.

Fast *and* ***Accurate*** *Simultaneous Inspection*

★ ★ ★ ★ **FEDERAL** ★ ★ ★ ★

PRECISION MEASURING INSTRUMENTS

Chicago • Cleveland • Detroit • Hartford • Los Angeles • Milwaukee • Montreal • Muncie
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MALLORY STANDARDIZED WELDING ELECTRODES

SPEEDIER PRODUCTION

BETTER WELDING

LESS DOWN TIME

LOWER COST

Ammunition Boxes for Air Battles!

A sky fighter such as the Curtiss P-40F or the "Tomahawk" needs plenty of ammunition to feed its many machine guns. Engineers at Curtiss-Wright Corporation have designed ammunition boxes that are easily interchangeable, strong enough to resist deformation and consequent "jamming", corrosion-resistant, compact and light in weight.

In fabricating these ammunition boxes from 18-8 stainless steel, Curtiss-Wright has achieved high production speeds by using spot welding . . . with standardized spot welding tips and holders supplied by Mallory.

Stainless steel parts of each ammunition box are assembled by tack welding with portable "guns". The box is completed by spot welding with a machine of the type illustrated above, at a speed of 90 spots a minute. Mallory Spot Welding Tips assure this fast, continuous production because they need redressing less often . . . produce more welds before replacement is necessary . . . and help make sound, clean welds.

Radio antenna masts for fighter planes are also rapidly fabricated by resistance welding, and here again, Mallory Standardized Welding Electrodes speed production, improve the finished product, and cut its unit cost. Mallory supplies seam welding rolls that take the 8000 amperes of current and the 600 pounds of pressure applied at the seam, in turning out sturdy airplane radio masts rapidly and well.

Mallory Standardized Welding Electrodes are available *promptly* . . . when and where you need them. Specify Mallory today, and keep ahead on tomorrow's production schedule!

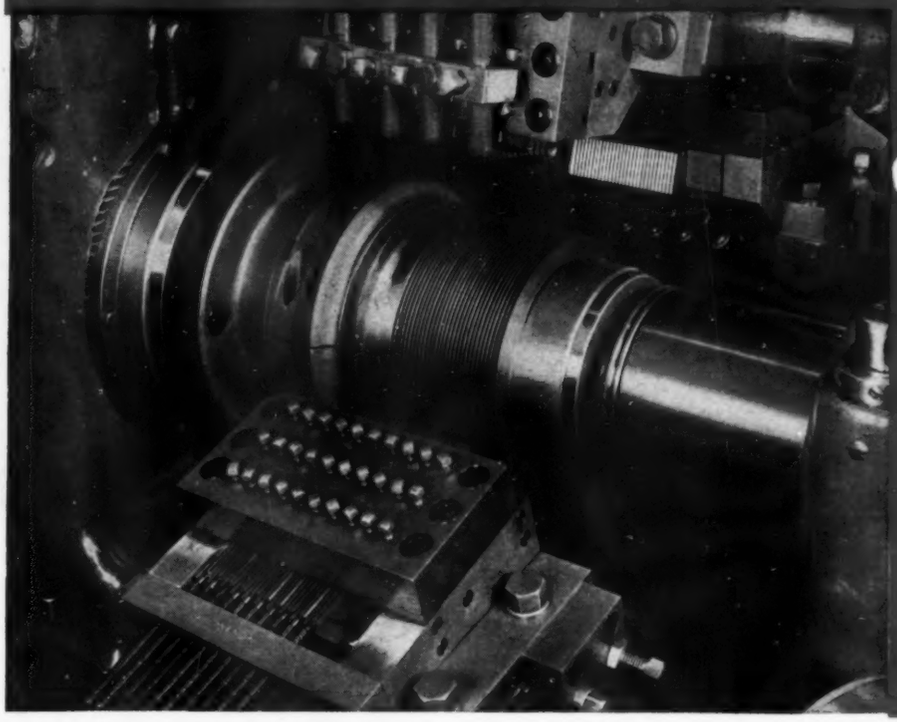
MALLORY Resistance Welding Data Book

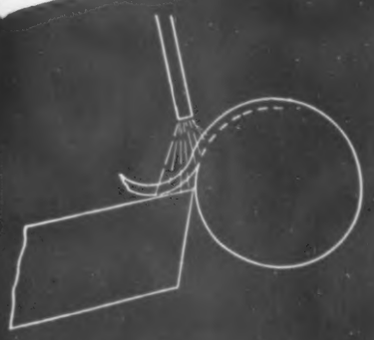
79 pages of factual information — write for your free copy today!

P. R. MALLORY & CO., Inc., INDIANAPOLIS, INDIANA • Cable Address—PELMALLO

RESISTANCE WELDING P.R. MALLORY & CO. Inc. MALLORY **STANDARDIZED ELECTRODES**

TOOL-LIFE INCREASED 25%





Despite the heat of 28 tools cutting at one time, the chip flows freely across the rake of the tool. No jamming; no marred finish. Texaco Transultex A in use.

THEY PREFER TEXACO

★ More Diesel horsepower on streamlined trains in the U. S. is lubricated with Texaco than with all other brands combined.

★ More locomotives and cars in the U. S. are lubricated with Texaco than with any other brand.

★ More revenue airline miles in the U. S. are flown with Texaco than with any other brand.

★ More buses, more bus lines and more bus-miles are lubricated with Texaco than with any other brand.

★ More stationary Diesel horsepower in the U. S. is lubricated with Texaco than with any other brand.

Tune in the TEXACO STAR THEATRE every Sunday night—CBS

Machining the cooling fins of aviation engine cylinders in the Fay Automatic Lathe . . . using three gangs of 28 tools each . . . the tool-life has been stepped up 25%.

This is typical of the results that you, too, can get through the proper selection and application of Texaco Cutting Oils.

On various kinds of war work, Texaco is increasing output, lengthening tool-life, decreasing down-time, improving finish.

The outstanding performance that has made Texaco preferred in the fields listed in the panel has made it preferred by prominent users in the metal-cutting field.

Texaco users enjoy many benefits that can also be yours. A Texaco Engineer specializing in the application of cutting coolants will gladly cooperate . . . just phone the nearest of more than 2300 Texaco distribution points in the 48 States, or write: The Texas Company, 135 E. 42nd St., New York, N. Y.

Care for your Car ..for your Country

TEXACO

TEXACO Cutting Oils

FOR THE METAL-WORKING INDUSTRY

HELP WIN THE WAR BY RETURNING EMPTY DRUMS PROMPTLY

Plomb Tools are weapons, too

The way you use your tools today will affect some fighting man at the front tomorrow. It will hurt him if you use them care*lessly*—it will help him if you use them care*fully*. Fine hand tools like Plomb are weapons in this mechanical war, because nearly all mechanical production begins with them.

Do your part by taking care of yours. Here are some suggestions. Keep as complete an assortment as possible. Use the right tool for the job, and use it properly, to avoid damage. Keep your tools in good condition, and put them away safely after use.

Now tools are more than screwdrivers and pliers and wrenches—they're weapons that build most of those things so desperately needed for Victory.

Plomb Tool Company, Los Angeles

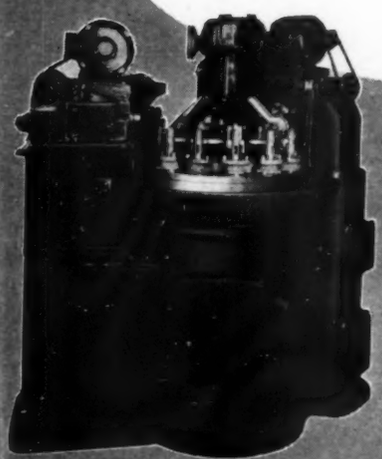
IN WAR *and in Peace..*

SOMMER & ADAMS EQUIPMENT

If equipment designed by Sommer & Adams is contributing definitely to a great step-up in war production, the reason is because it is, first of all, *precision equipment*. There is no speed without precision. There is no output apart from precision . . . The machines shown above are helping Industry now to make and break records month after month. The machines shown below belong to the ways of peace. One factor is common to both groups: *all are precision machines*. If you have special requirements on the side of precision which 20 years of careful design and construction may be able to fill, command us.

★ ★ ★

Ask for the facts on the Cleveland No. 1 Vertical Milling Machine—a real production aid.



Drilling and milling machine, 12-station, indexing type, for pump bodies.

← Hydraulically operated, 3-head machine for milling and tapping operations on farrow axles.

Hydraulically operated, double-end machine for milling operations on pump bodies, 4-station, indexing type.

Resolve to invest at least 10 percent of your income in your country's future. Buy war bonds and often

THE SOMMER & ADAMS COMPANY

18511 EUCLID AVENUE • CLEVELAND, OHIO

EQUIPMENT FOR MANY PURPOSES

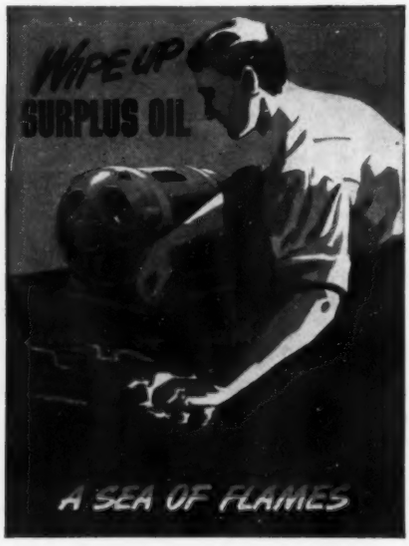
FIGHTING FIRES before they start

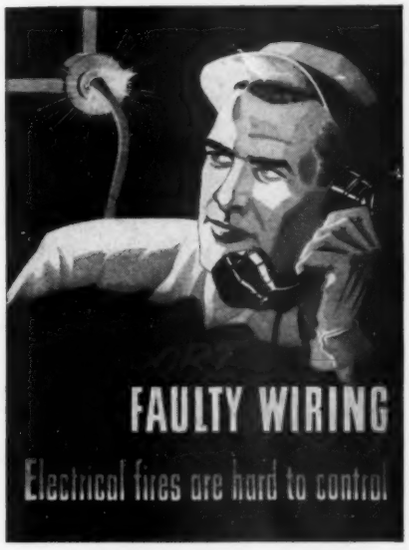
Most fires are preventable. A smoldering cigarette, flipped carelessly into a dark corner . . . a welder's spark flying unnoticed into a pile of oily waste—these little things can, and do, start devastating fires.

At the beginning of the war emergency, recognizing that fire is a treacherous and deadly saboteur of production, Bethlehem intensified its attack on the fire hazard. As always, trained, fully-equipped fire-fighting forces supplied the backbone of the fire-control effort, maintaining day-and-night vigilance in every Bethlehem plant and shipyard.

But to bring home the vital importance of fire prevention and control to every Bethlehem employee, we've designed a series of posters in full color and are displaying them in key locations throughout all Bethlehem shipyards and steel plants, which are now engaged in vital war work.

These posters are based on analysis of the most serious causes of fire and the all-important part of the human element in fire prevention. By pointing out to employees specific ways in which they can prevent or subdue fires, the posters are helping to minimize a potentially grave threat to the production of war materials.



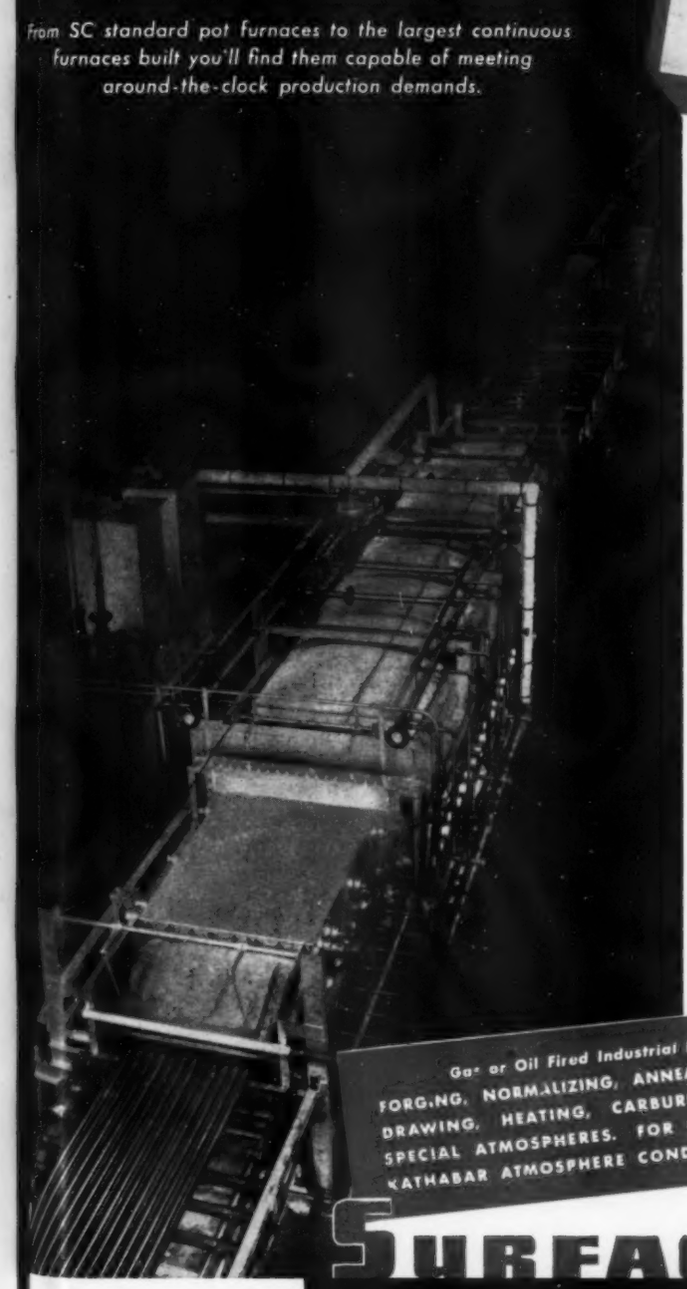


Five of Bethlehem's series of fire-prevention posters. These posters are printed in full color. Each poster is designed to emphasize a specific problem in fire prevention or control.

BETHLEHEM STEEL

War-production plant executives who are carrying on fire-prevention campaigns may find these posters of interest. A complimentary set will be supplied on request to Bethlehem Steel Company, Bethlehem, Pa.

From SC standard pot furnaces to the largest continuous furnaces built you'll find them capable of meeting around-the-clock production demands.



168 Hours a week!

TAKING IT AND LIKING IT

That's the proven production story of SC Furnaces. They're tough, sturdy and stand the stress of 24 hours a day, 7 days a week operation called for by Donald Nelson in his "all out for Victory" program. Production of good equipment to speed operations, to save man hours, to conserve time and improve materials has always been an SC tradition. For example, SC engineers have made certain that alloy mechanisms used for material handling would work in high temperatures —and continue to operate under the most severe conditions.

Before mid-summer industry will be working around the clock. Machines will undergo a gruelling fatigue test. But America's machines, like its manpower, can take it, because many equipment manufacturers such as SC have followed the simple principle of "he profits most who serves best."

Whatever your heat treat requirements may be for war production, whether you need standard or special design, batch or continuous types, SC can be depended upon to furnish the equipment best suited to your production needs and to deliver the equipment according to schedule.

You can depend on SC equipment, engineering service and delivery committments. Today, more than ever before, this is important. You can't afford poor or obsolete equipment—it's a liability and luxury to you and to the victory we must win.

SURFACE COMBUSTION • TOLEDO, OHIO

Gas or Oil Fired Industrial Furnaces for:
FORGING, NORMALIZING, ANNEALING, HARDENING, DRAWING, HEATING, CARBURIZING, NITRIDING, SPECIAL ATMOSPHERES. FOR DRY BLAST USE SC KATHABAR ATMOSPHERE CONDITIONING SYSTEMS.

SURFACE COMBUSTION

MANUFACTURERS OF INDUSTRIAL FURNACES • JANITROL GAS-FIRED SPACE HEATING EQUIPMENT • KATHABAR AIR CONDITIONING SYSTEMS

EYE PROTECTION COSTS SO LITTLE...
EYE INJURIES COST SO MUCH

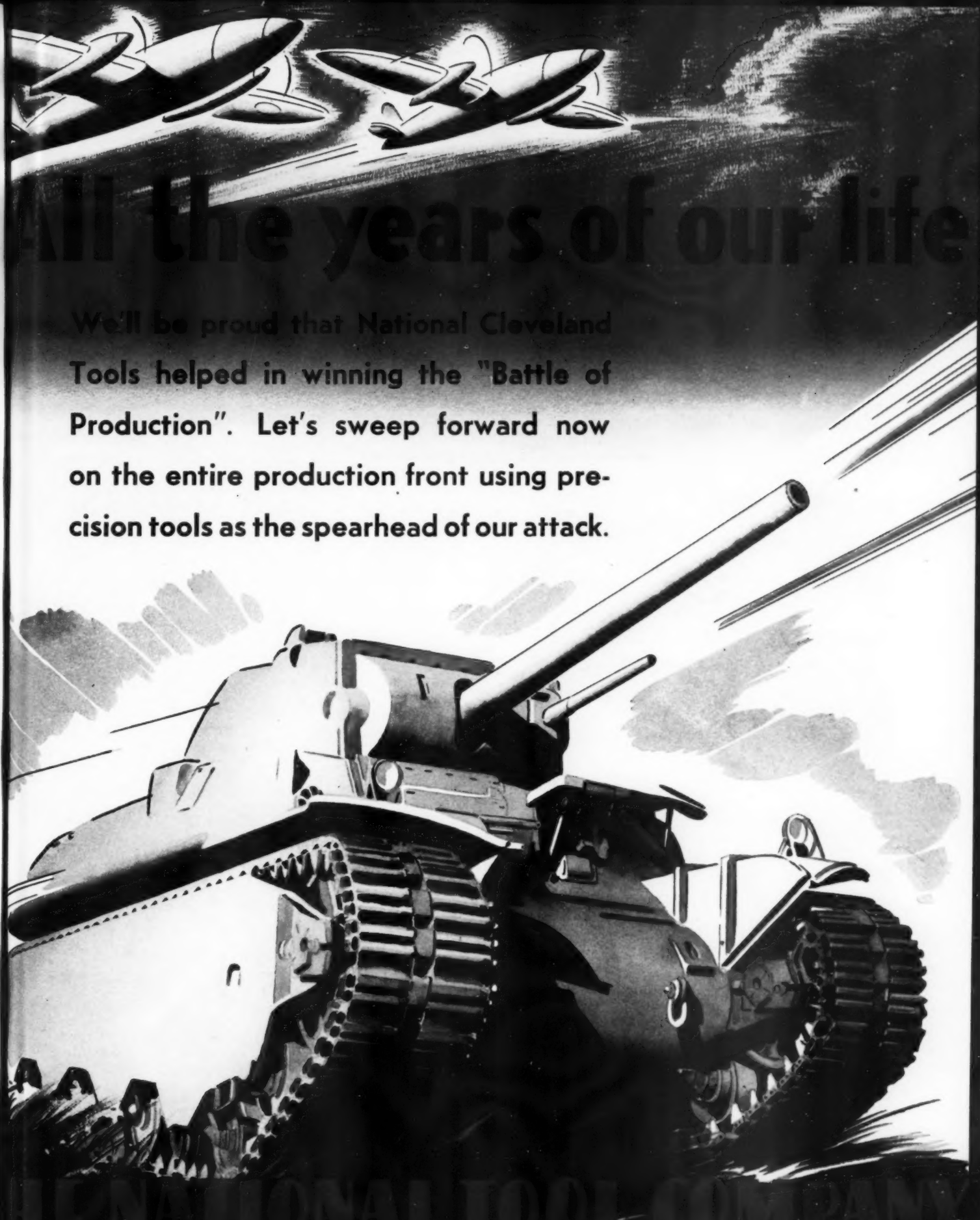
Give All Your Workers AO Goggles

The best eye protection for all your workers — men and women — calls for a comparatively small investment which pays for itself many times over.

But the cost of *neglecting* eye protection is STAGGERING. In lost man-days *alone,* eye injuries in 1941 cost America enough time to build hundreds of ships, thousands of planes.

Call in an AO Safety Representative today for the assistance he can give your own Safety Director. He offers a complete line of strong, lightweight goggles for every type of industrial eye hazard and many other aids to an efficient, economical eye protection program — including effective posters, unique eye charts and other helpful literature.

American Optical
COMPANY
SOUTHBRIDGE, MASSACHUSETTS



All the years of our life

We'll be proud that National Cleveland Tools helped in winning the "Battle of Production". Let's sweep forward now on the entire production front using precision tools as the spearhead of our attack.

THE NATIONAL TOOL COMPANY

11200 Madison Avenue, Cleveland, Ohio

BS • GEAR SHAPER CUTTERS • GEAR CUTTERS • MILLING CUTTERS
CIRCULAR AND FLAT FORM TOOLS • REAMERS • BROACHES
COUNTERBORES • SLITTING SAWS • SPECIAL TOOLS

Make this label your key to new or conversion lighting

For large plants or small

wherever fluorescent lighting is needed to speed the job . . .

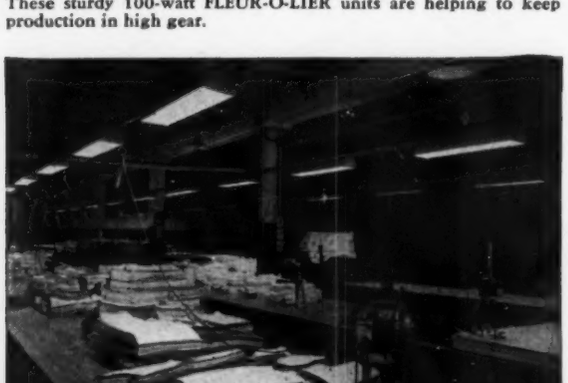
specify FLEUR-O-LIERS

With War needs forcing plants to cram three days' work into one, the value of dependable fluorescent lighting is making itself more evident than ever. Whether it's in an office, drafting room or out in the shop, you can specify FLEUR-O-LIERS, and be sure of getting fixtures built for dependable service and maximum lighting performance. The FLEUR-O-LIER label is your key.

FLEUR-O-LIERS are made in various sizes and designs by over 45 leading fixture manufacturers located at important points all over the country. This means better service on war plant orders, for either new or conversion lighting.

FLEUR-O-LIERS are *tested* and *certified* by impartial Electrical Testing Laboratories of New York as meeting 50 definite Standards set up by MAZDA lamp manufacturers for balanced performance and satisfactory operation.

A vital tool in wartime production, fluorescent fixtures now require a suitable WPB priority rating. Any of the FLEUR-O-LIER Manufacturers, your electrical contractor, wholesaler or electric service company will be glad to work with you on this to get the best lighting possible.



Precision and speed are uppermost in this airplane engine plant. These sturdy 100-watt FLEUR-O-LIER units are helping to keep production in high gear.

FLEUR-O-LIERS provide even, shadow-free light in this fabrics shop helping to prevent cutting mistakes which would mean accidents and waste.

Get this new booklet for full details and list of manufacturers. Write FLEUR-O-LIER MANUFACTURERS, 2133-8 Keith Building, Cleveland, Ohio.

FLEUR-O-LIERS

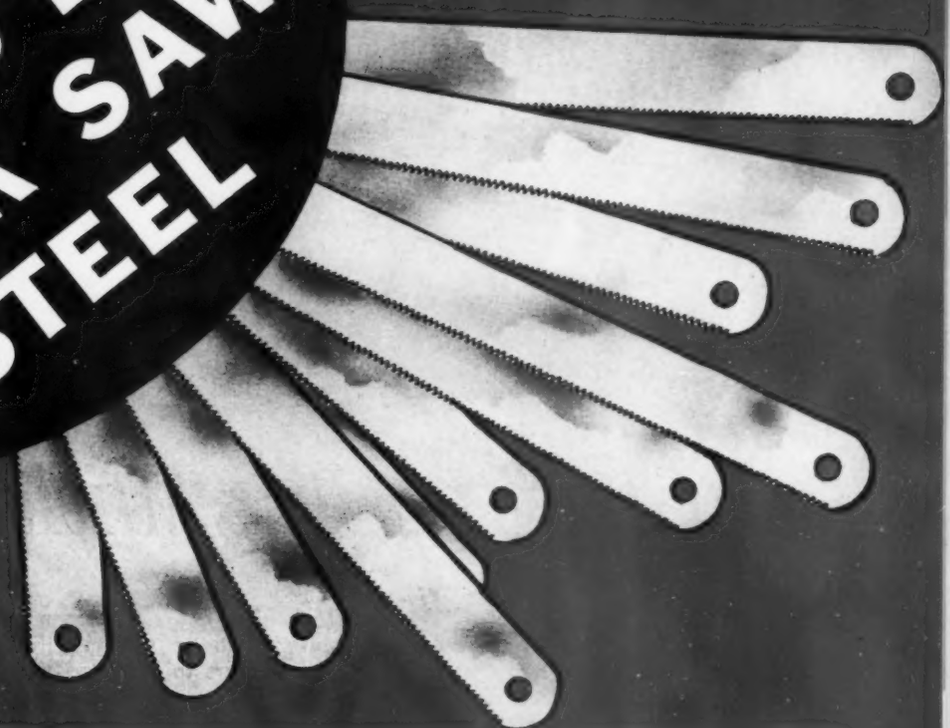
CERTIFIED FIXTURES FOR FLUORESCENT LIGHTING

Participation in the FLEUR-O-LIER MANUFACTURERS' program is open to any manufacturer who complies with FLEUR-O-LIER requirements

A New Steel *Perfected*—

Just when You Need it Most!

INGERSOLL D-B-L* HACK SAW STEEL



* *Produced under exclusive license arrangement with Allegheny-Ludlum Steel Corporation*

Other Special INGERSOLL Sheet Steels include:

- Alloy Steels
- Armor Plate
- Clutch Plate Steels
- Tillage Steels
- Soft Canter Steels
- Shovel Steels
- Knife Steels
- TEM-CROSS Steel
- IngAclad (Stainless-Clad Steel)
- Stainless Steels and Saw Steels, including "18-4-1" and Molybdenum and D-B-L Hack Saw Steels.

Faced with the biggest job it has ever known, American Industry welcomes the timely development of Ingersoll D-B-L.

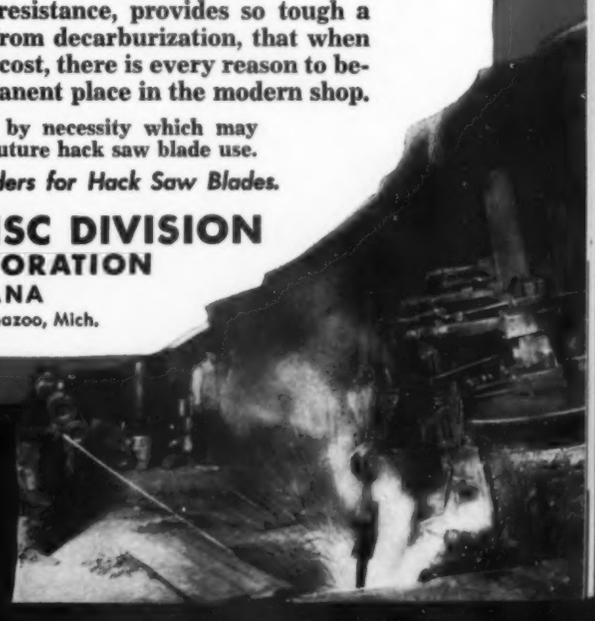
With 18-4-1 restricted by the shortage of vital alloys, the problem of supplying hack saw blades that would meet every shop need became a serious one.

Ingersoll D-B-L is so high in impact resistance, provides so tough a cutting edge, and is relatively so free from decarburization, that when these advantages are added to its lower cost, there is every reason to believe Ingersoll D-B-L has found a permanent place in the modern shop.

Here is one substitute developed by necessity which may well become the prime metal for future hack saw blade use.

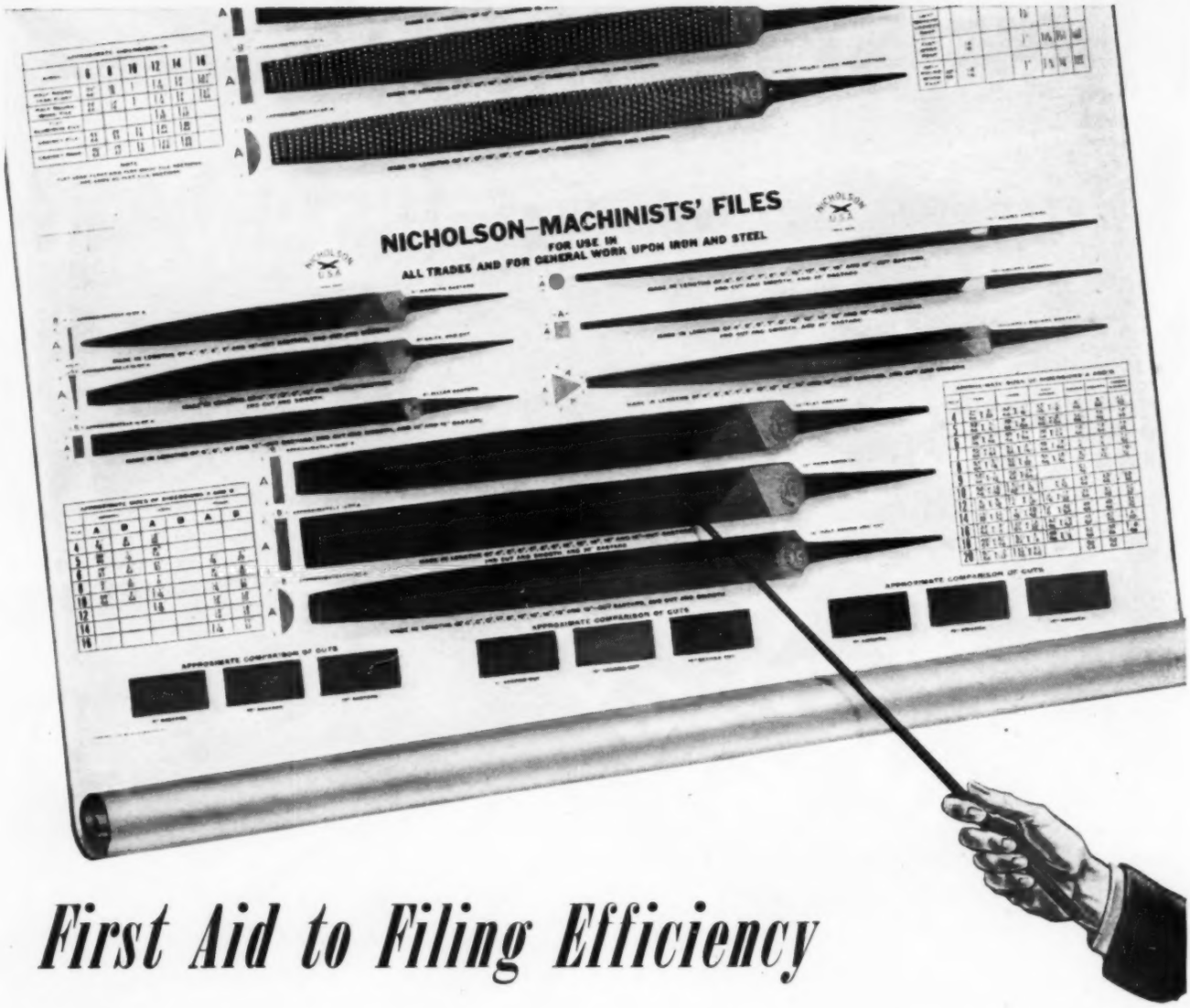
Specify Ingersoll D-B-L Steel on orders for Hack Saw Blades.

INGERSOLL STEEL & DISC DIVISION
BORG-WARNER CORPORATION
NEW CASTLE, INDIANA
Plants: New Castle, Ind.; Chicago, Ill.; Kalamazoo, Mich.



INGERSOLL

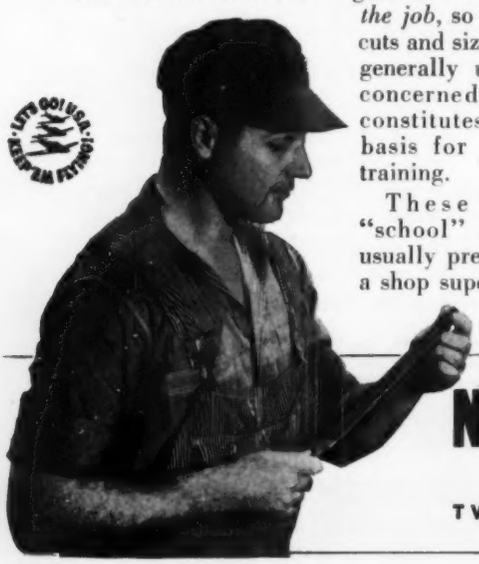
SPECIAL STEELS for SPECIAL USES



First Aid to Filing Efficiency

BESIDES making files of inherently high filing efficiency, Nicholson has developed numerous aids to enable machine-shop managements and workers to *bring out* that efficiency.

The Nicholson Wall Chart — portion of which is reproduced above — is one. In addition to serving as a convenient tool-room guide to *The right file for the job*, so far as shapes, cuts and sizes of the more generally used files are concerned, this Chart constitutes a valuable basis for "classroom" training.



These employee "school" sessions are usually presided over by a shop superintendent or foreman. And from their extensive studies of individual filing problems, Nicholson service engineers themselves have delivered educational talks before such groups.

Elementary literature on filing and technical bulletins on the features and uses of special purpose files are also available.

If you've a training auxiliary or program in which we can be of help with any of the aids indicated above, *write us about it*. For your file needs—and practical help on file purchases — contact your mill-supply house.

NICHOLSON FILE CO. • PROVIDENCE, R. I., U. S. A.
(Also Canadian Plant, Port Hope, Ont.)

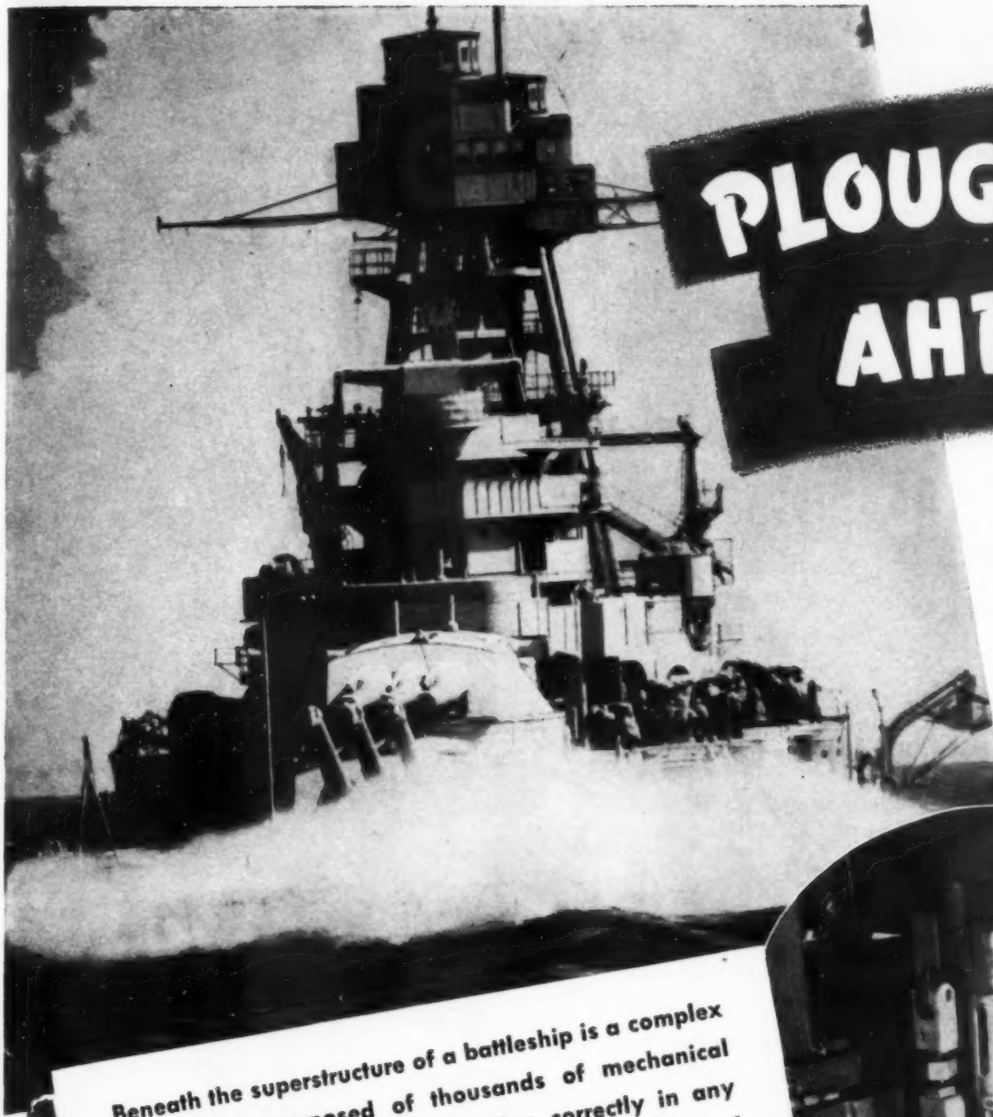
SAVE MAN-HOURS through the proper use of files . . . through *The right file for the job* . . . and through the highest quality files made—Nicholson and Black Diamond.

NICHOLSON FILES

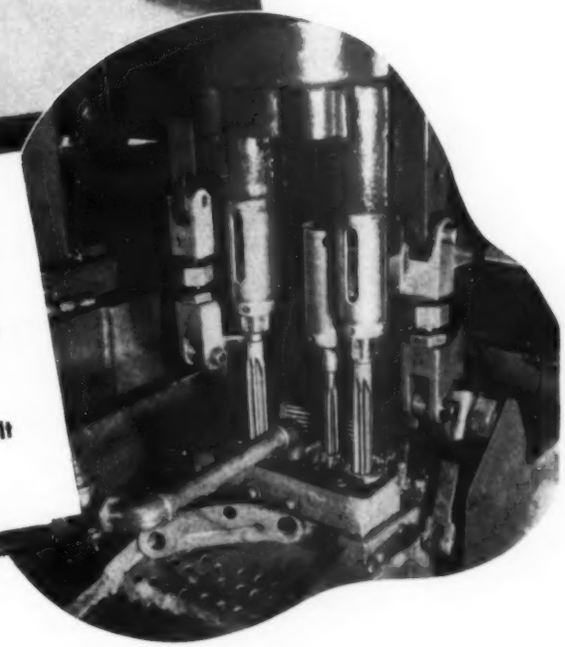
FOR EVERY PURPOSE

TWELVE PERFECT FILES IN EVERY DOZEN

NICHOLSON U.S.A. MADE IN U.S.A.



PLOUGHING AHEAD



Beneath the superstructure of a battleship is a complex mechanism composed of thousands of mechanical parts. Whether these parts function correctly in any emergency is in large measure due to the quality of the tools used to manufacture them.

National Cutting Tools are tools of character, built for hard use, long life, exacting precision.

NATIONAL

NATIONAL TWIST DRILL & TOOL DETROIT U.S.A.

TWIST DRILL AND TOOL COMPANY

...for inspecting gages as well as for parts production inspection...use the SCHERR COMPARITOL

RANGE OF SCALE .004"
GRADUATED TO .0001"
MEASURING RANGE 0-6" STANDARD
0-8" HEAVY DUTY

Accurate, sensitive and dependable enough to be used by many of American's premier gage makers for inspection of *the gages they make*, the COMPARITOL is also rugged and sturdy enough to be used daily in shops for inspection of thousands of mass-produced parts.

In one plant, 60 COMPARITOLS are paired with batteries of grinders for inspection of centerless ground work *as the work goes through production*, without loss of time or material.

Write today for folder explaining why the Comparitol belongs in your shop

EXCLUSIVE LEVER MECHANISM

The Measuring Head holds the operating mechanism which consists of only 2 moving parts—the vertical spindle with feeler point and the vertical lever and pointer assembly. The new patented knife-edge bearing construction (illustrated here in simple form) is largely responsible for the COMPARITOL'S extreme accuracy, reliability and long life. This exclusive design is featured by a V-notch block of two-piece construction which eliminates any fillet or radius at the apex. As a result, a degree of accuracy is attained which is higher than that ordinarily available in precision instruments.

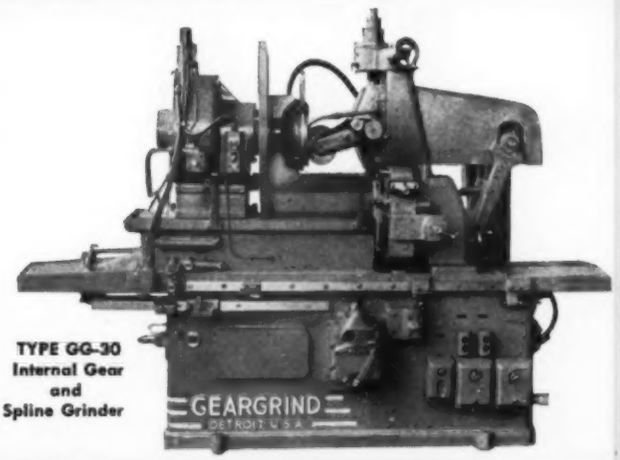
GEORGE SCHERR COMPANY
124 Lafayette Street
NEW YORK

FORMED-WHEEL

Internal GEAR GRINDING

The *only* method of grinding hardened internal gears. Gives full control of root—straight, definite radius fillets or full radius. GEARGRIND Internal Gear Grinding Machines handle diameters from 3½″ to 16″.

The Formed Wheel Method is ideal for grinding cluster gears, and other gears of cramped design. It was originated by The Gear Grinding Machine Company, the world's largest manufacturer of Formed Wheel Grinding Machines for external and internal gears, external and internal involute splines, straight splines, serrations and racks. Catalog of GEARGRIND machines, special equipment and contract grinding on request.



TYPE GG-30 Internal Gear and Spline Grinder

The GEAR GRINDING MACHINE COMPANY
DETROIT MICH. U.S.A.

Have You Seen the NEW DRIVE-ALL CATALOG on Motorizing Machine Tools?

"Frankly, I hadn't given much thought to individual motor drives till I looked inside this Drive-All catalog. First thing I saw was a couple pages about what it would do for me:– increase production, cut production and maintenance cost, improve appearance and working conditions. That's my meat, so I read on and found out that this Drive-All unit is really engineered for quick application, high efficiency and long life. I'm sold."

Standard Drive-All selective speed motorizing unit for universal application on belt-driven machines. 1 to 10 H.P. in either 3- or 4-speed models. Can be mounted for average machine in about two hours time. All models also available with clutch and with right or left hand output. Variety of standard mounting brackets save installation time.

- ☐ LATHES AND TURRET LATHES
- ☐ MILLING MACHINES
- ☐ GEAR CUTTERS
- ☐ DRILL PRESSES AND RADIALS
- ☐ AUTOMATICS
- ☐ SHAPERS AND PLANERS
- ☐ TAPPERS
- ☐ BORING MILLS
- ☐ SPECIAL APPLICATIONS

A card or letter will bring you a copy of the New Drive-All catalog. All inquiries given prompt attention.

DRIVE-ALL MANUFACTURING COMPANY DETROIT, MICHIGAN

Discuss your Cutting Oil Problems with a Cities Service Lubrication Engineer!

Due to war production and priorities, many manufacturers today are using new and unfamiliar materials—and each presents a new and unfamiliar cutting oil problem.

Unless these problems are solved quickly and economically, they can cost you real money in lost time, damaged equipment and poor results.

Why not have a Cities Service Lubrication engineer go over your cutting oil problems? You'll find he has up-to-the-minute information that can help you get maximum production . . . maximum tool life . . . and a better finish.

This friendly personal service is yours without cost or obligation. All you need to do is write on your own letterhead to the nearest Cities Service office listed below.

We shall be glad to send you an informative booklet, "Metal Cutting Lubrication." Just check the space indicated!

OIL IS AMMUNITION — USE IT WISELY!

CITIES SERVICE OILS
ONCE-ALWAYS

Write to —
CITIES SERVICE OIL COMPANY
Room 1326, Sixty Wall Tower, N. Y.

or any of the following offices:
CHICAGO . CLEVELAND . ST. PAUL
KANSAS CITY . BOSTON . TORONTO

or to
ARKANSAS FUEL OIL COMPANY
SHREVEPORT . ATLANTA . BIRMINGHAM

Please send me information concerning your Engine Lubrication Service. ☐

Please send me your booklet, "Metal Cutting Lubrication." ☐ A.M.

Name_____

Firm Name_____

Address_____

City_____ State_____

A LUBRICANT FOR EVERY INDUSTRIAL NEED

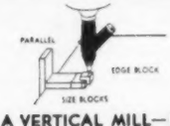
CENTER SCOPE

Like the surveyor's transit—
the CENTER SCOPE is an OPTICAL LOCATING AND CENTERING TOOL
—that can be used on any machine!

THE CENTER SCOPE is a *rugged shop tool*—a time-saving, mistake-saving optical instrument with 45x magnification. It's easy, accurate, quick precision eliminates the human errors in tooling. Used 'on the job' it's not affected by wear, temperature or mechanical pressure. You can quickly locate edges or layouts to a spindle axis *'within a tenth'*, compensate for run-out, set-up faster and easier—and YOU CAN ACTUALLY SEE THAT YOU ARE RIGHT!

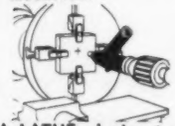
The CENTER SCOPE is a necessary production tool—necessary today because you are interested in saving time—tomorrow because you will be interested in saving costs! Get the full story NOW! Write the CENTER SCOPE INSTRUMENT CO., 355 South La Brea Avenue, Los Angeles, Calif.

ON A JIG BORER—ease of locating two edges as "zero points" —*Advantage*—UNFAILING ACCURACY and the ability to repeat set up within .0001".



ON A VERTICAL MILL—locating and centering from an edge with size blocks—*Advantage*—JIG BORER ACCURACY on more machines.

ON A HORIZONTAL MILL—the ability to center a layout, edge block or rotary table plug while spindle is running. *Advantage*—QUICK AND EASY set up for high precision work.



ON A LATHE—boring, turning or facing from a scribed layout—location accuracy .0001"—*Advantage*—TIME-SAVING!

FREE OPERATING MANUALS!
1. The CENTER-SCOPE and its Operation.
2. The CENTER-SCOPE and Optics.

AN EYE FOR ACCURACY

THEY'LL GET THERE *First* --- WITH THE *Most!*

GETTING there "fustest with the mostest" is an axiom as important in the warfare of production as on the battle front. That's why, in hundreds of America's highly geared war plants, you'll find P&H Zip-Lifts handling materials beside machine tools, along production lines, in warehouses, loading zones, etc. They're saving time, man-power—helping get America there *first* with the *most!*

CAPACITIES
250, 500, 1,000 and 2,000 lbs.

IT'S a small, *wire rope* electric hoist with full magnetic push button control; with lifting capacities of 250, 500, 1,000 and 2,000 pounds. Bolt, hook or trolley mountings are interchangeable. To aid the war effort, qualified defense plants can absolutely depend upon P&H's honest delivery dates.

General Offices: 4514 West National Avenue, Milwaukee, Wisconsin

HARNISCHFEGER CORPORATION
HOISTS · WELDING ELECTRODES · MOTORS P&H EXCAVATORS · ELECTRIC CRANES · ARC WELDERS

SIMPLIFIED CONTROL

MEETS THE URGENT DEMAND FOR INCREASED PRODUCTION

One and three-quarter tons of high speed sawing machinery controlled by your finger tips speeds production by cutting down handling and loading time.

Control and operation of RACINE High Speed Saws is simple and easy with all controls conveniently located in front position . . .

1. **A Single Lever** shifts the sliding gear transmission for providing cutting speeds of 60, 90, and 130 strokes per minute.
2. **A Single Graduated Dial** controls cutting by setting feeds exactly for the full run of materials from thinnest walled tubing to heavy bars, billets and die blocks.
3. **A Single Lever** controls all operating phases, clutch, rapid traverse, rest, and height and depth of cut. Nothing to wear or get out of adjustment.

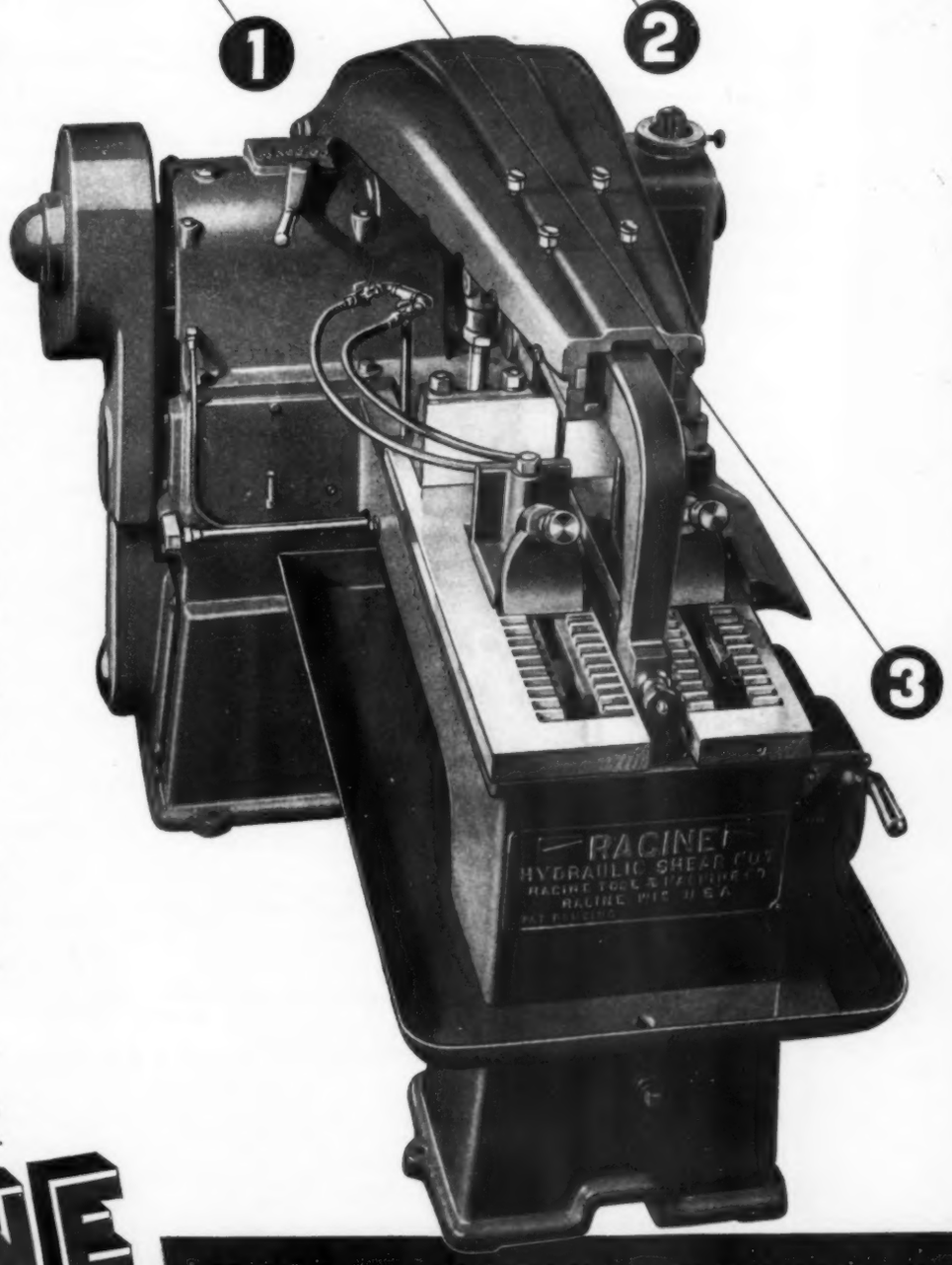
This is simple fool proof construction. It makes inexperienced operators produce more . . . faster . . . with greater accuracy. RACINE Heavy Duty saws are made in capacities of 10" x 10" to 14" x 20".

Write for catalog 80-B describing these saws in detail or for information on RACINE'S complete line of saws from 6" x 6" to 14" x 20" in production, general purpose, and automatic types. Get your production done faster — use RACINE.

"Standard the World Over"

Racine Tool and Machine Co.

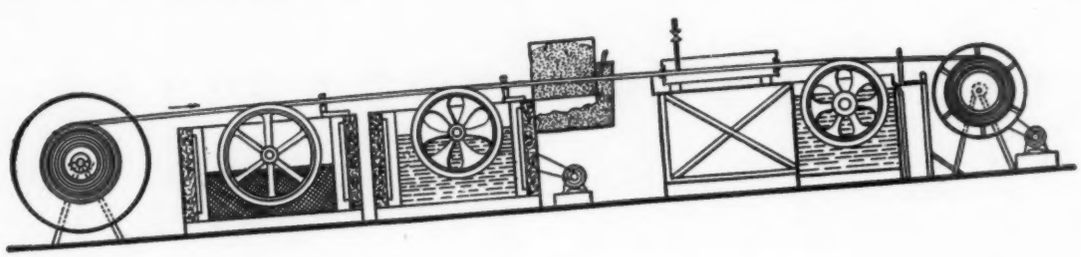
1751 STATE ST. RACINE, WIS.



RACINE

METAL CUTTING MACHINES

WAR
is engineered scrap



This war machine was built from an old pulley, the rear wheels of a truck and odds and ends of sheet steel.

It will never fire a projectile nor drop a bomb. But if our enemies really understood America it would frighten them.

The function of this scrappy gadget is to renew the weather-proofing on electric power wire . . . wire that would otherwise have to be junked.

▶ But war teaches us to look beyond machines to the hearts and minds of the men who make them.

In such perspective the device shown above takes on deep significance. It becomes a mechanical parable on the ingenuity of men whose job it is to keep electric power flowing to the vital war industries, regardless of shortages of copper, steel, rubber, aluminum.

▶ There are hundreds of such parables in every war-converted industry. Here are just a few from our great electric power plants:

. . . tons of bolts are being saved by a new method of rigging crossarms on electric poles.

. . . a southern generating station found its dam weakening. To keep the power flowing, holes were bored through the concrete and the dam bolted to bedrock!

. . . to avoid a shutdown, a middle-Atlantic utility worked out a method of stopping leaks around the giant valves controlling its water supply by mixing *sawdust* with the water. It worked.

. . . a western company bought old suspension cables from the wrecked Tacoma Bridge, untwisted them and used the metal as concrete reinforcement.

So goes the saga of electric power, as the industry does its share in the common task . . . With much of its trained man-power in the services, with priorities available only in the most urgent cases, the American utilities are showing the stuff American management and labor are made of.

But where are the stories of plants rushed into being almost overnight to supply electric energy?

As an American, you can thank your lucky stars such stories are few. Generating plants and power lines take years to build. For instance, our country's power equipment at the start of the war represented an investment of more than the present combined cost of the two-ocean navy and lend-lease expenditures.

War conversion for this vigorous industry was almost as simple as pushing the light switch on your reading lamp. The power was there because energetic managements had created it in the normal course of American life.

Some rush construction was necessary, but the electric power industry was first in war *because* it had been first in peace.

▶ The story goes back to the depression years. The utilities were the first to shake off the doldrums. By 1935, they had already passed 1929 levels.

. . . By the time the war broke out in Europe, America's giant electrical capacity surpassed that of any combination of potential enemies.

. . . It has grown since then, with 3½ million kw. capacity scheduled to be added in 1942. This year, the industry also will spend 150 million dollars on maintenance alone.

▶ Because of these private expenditures, because the electrical companies started years ago to sell women on the convenience of electrical home appliances . . . and because the industry has always built in advance of demand, it was ready for either peace or war, with the world's greatest system of power production and distribution.

* * *

In recognition of the miracle of war production—accomplished through the cooperation of American management and labor with the W. P. B. . . . this advertisement is published by the McGraw-Hill Network of Industrial Communication.

McGRAW-HILL PUBLISHING COMPANY, Inc.

330 WEST 42nd STREET • NEW YORK

WITH A POSTSCRIPT

FOR BUSINESS EXECUTIVES

PERHAPS you saw the advertisement on the opposite page, in the newspapers.

Did you notice those five examples of the way in which maintenance men are meeting the problem of war operation?

That's what this page is about.

If one public utility maintenance man works out a new way of reconditioning wire, his idea becomes really valuable to the country when all maintenance men with a similar problem find out how he did it.

If one man experiments with silver and bismuth as a substitute for tin solder, that becomes great news for a man who needs tin solder and can't get it.

That's why industry after industry has been able to meet the war production challenge . . . by swapping ideas.

▶ In industry, this idea swapping is done mostly through the editorial and advertising pages of the industrial press.

McGraw-Hill, for instance, keeps 153 editors and 725 engineer-correspondents busy digging up new methods of doing things.

Industrial advertisers, too, often send men into the field to discover new ways of making their products do more work, or last longer.

When such practical editorial and advertising information is distributed to the readers of the 23 McGraw-Hill publications, the value of each idea is multiplied by thousands.

So valuable is this interchange of technical information that many companies are surveying their organizations to make sure that the supply of Industrial Magazines is adequate.

▶ If you would like suggestions as to how to conduct such a survey, just write to Reading Counselor Department, McGraw-Hill Publishing Company, Inc., 330 West 42nd Street, New York.

* * *

THE McGRAW-HILL NETWORK

More than 1,000,000 of the executives, designers and production men, who give America her world supremacy in technical "know-how", use the editorial and advertising content of the 23 McGraw-Hill publications as a means of exchanging ideas.

THE McGRAW-HILL BOOKS

Technical, engineering and business books for colleges, schools, and for business and industrial use.

McGRAW-HILL PUBLISHING COMPANY, INC.
330 WEST 42nd STREET • NEW YORK

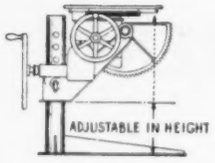
THE McGRAW-HILL NETWORK OF INDUSTRIAL PUBLICATIONS

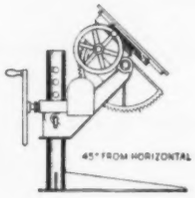
American Machinist
Aviation
Bus Transportation
Business Week
Chemical & Metallurgical Engineering
Coal Age
Construction Methods
Electrical Contracting
Electrical Merchandising
Electrical West
Electrical World
Electronics
Engineering & Mining Journal
E. & M. J. Metal and Mineral Markets
Engineering News-Record
Factory Management & Maintenance
Food Industries
Mill Supplies
Power
Product Engineering
Textile World
Transit Journal
Wholesaler's Salesman

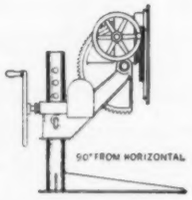
★ welding economy

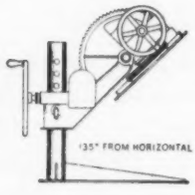
STARTS

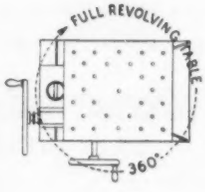
with efficient handling of welding assemblies











After a welding assembly is once fastened to the table of a C-F Welding Positioner, the welder, without any other help, can tilt the work to any angle from horizontal to 135° beyond horizontal and he can turn it to any degree within a complete circle. This means better welds all "down hand," safer handling and faster production. Sizes from 1200 to 14000 lbs. capacity are described in our booklet WP 22. Write for your copy. It tells the complete story.

CULLEN-FRIESTEDT CO.,
1313 S. KILBOURN AVE. CHICAGO, ILLINOIS

Increased Production

means more jobs for

MACHINISTS

—and MORE PAY for men who know their work

This big home-study and reference course gives you the practical facts on machines and methods you need to advance in machine shop work. Take advantage of the other man's experience as found in books, to solve your problems, increase your efficiency with

AMERICAN MACHINISTS' LIBRARY

6 volumes, 2516 pages, 2368 illustrations, many charts and tables

THESE books answer your questions on methods and machines—tell what you need to know about the operation of machines of all types and sizes for the whole range of metal cutting, forming, and finishing operations —show by text, diagram, and illustration the essential points of setting up work, adjusting machines, selecting feeds and speeds, determining pressures, handling materials, devising short-cuts, etc.

Puts the mastery of machine-shop work at your fingertips

With these books at hand for quick reference, no job is too hard or unusual, and the routine jobs may be improved, with savings in time and trouble and reduced wastage.

What the Library gives you

—complete guide for everybody, from shop executive to apprentices, interested in the operation of machines used in turning and boring practice

—description of all important varieties of machines, both manual and automatic, and methods of operating them

—data on speeds and feeds, new cutting alloys and materials, use of coolants, etc.

—practical information on grinding machines and abrasive wheels, showing what they do, how to operate them, and how to make best use of them on various types of work.

—training in the various operations performed in drilling and surfacing materials in the machine shop

—exact, descriptive data on all aspects of gear-cutting practice, useful in shops of any size

—essentials of selecting machines, setting up work, and handling operations in reaming, tapping, planing, shaping, slotting, milling, and broaching

No Money Down — Easy Payments

Let us send you these fact-packed books for 10 days' examination, with no obligation to buy the books unless you want them. Remember that, if you decide to keep the books the special library price represents a saving of $2.00 on the price of the books if you were to buy them separately. Furthermore, you may have the privilege of paying in small monthly installments, while you use the books. Invest in life's soundest commodity—KNOWLEDGE. Send the coupon today.

McGRAW-HILL ON-APPROVAL COUPON

McGraw-Hill Book Co., Inc., 330 W. 42nd St., N. Y. C.

Send me the American Machinists' Library, 6 volumes, charges prepaid, for 10 days' Examination. If I find the books satisfactory, I will send you $1.50 in 10 days, and $3.00 a month until the special price of $19.50 has been paid. Otherwise I will return the books postpaid. (To insure prompt shipment write plainly and fill in all lines.)

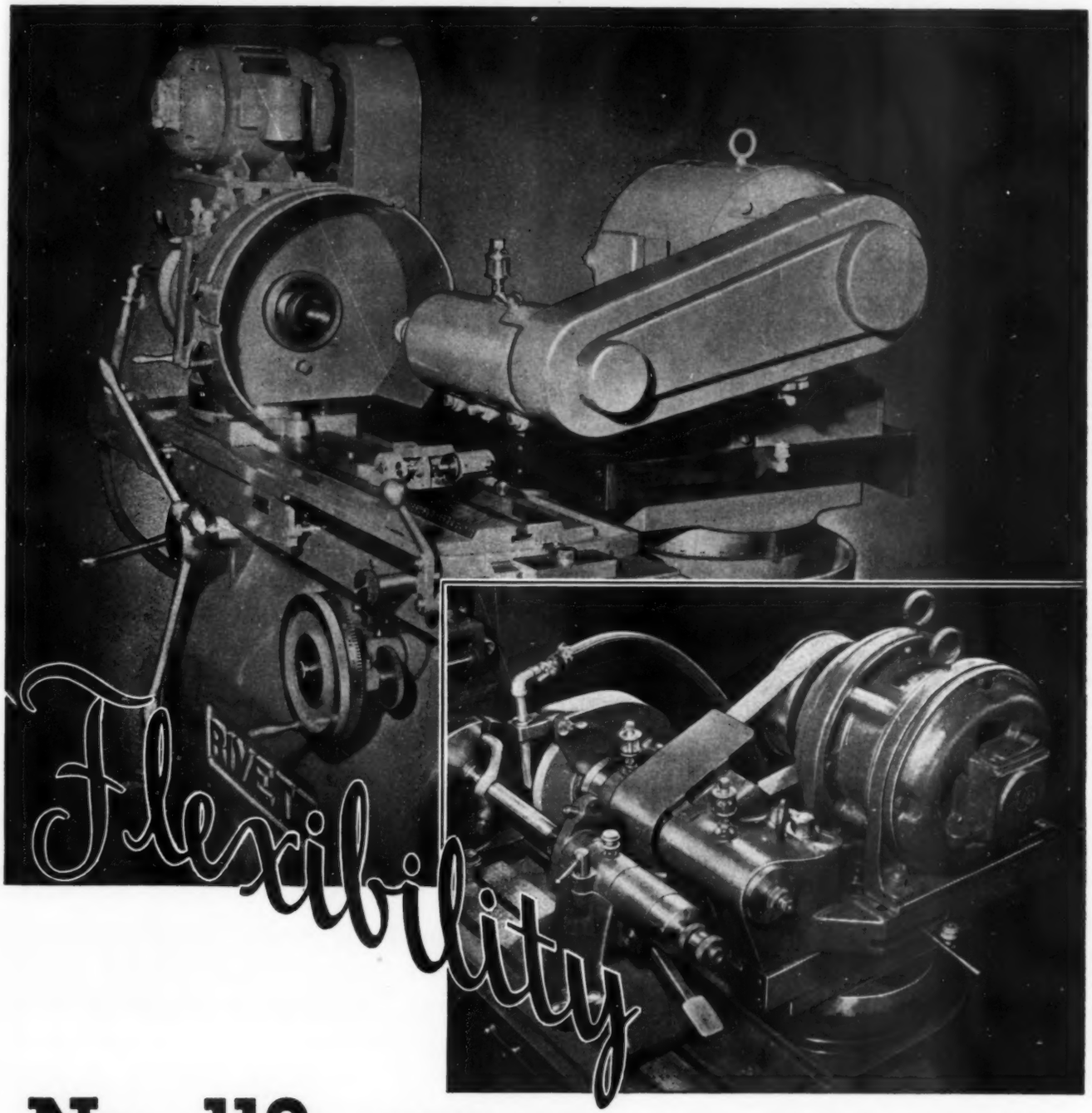
Name .....

Address .....

City and State .....

Position .....

Company .....A. 8-6-42



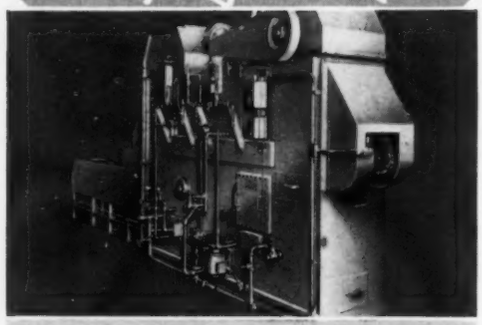
No. 112 UNIVERSAL GRINDER

Primarily is for medium and large internal and external tool-room grinding, straight, bevel, two angle or straight and bevel at one setting. Wide range of adjustments makes it effective on a great variety of work while its extreme simplicity of design enables any mechanic to operate it. Complete specifications sent on request.

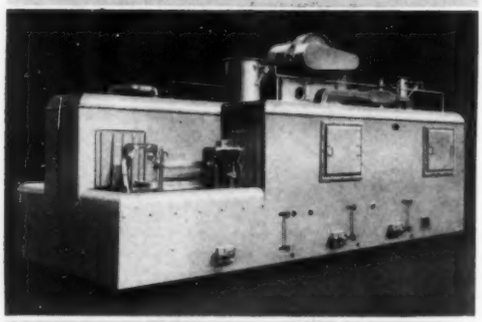
RIVETT LATHE & GRINDER INC.
BRIGHTON, BOSTON, MASS.

DETREX SERVICE

Guards The Efficiency Of Your METAL CLEANING OPERATIONS



Special vapor spray vapor degreaser used for the cleaning of small shells.



Washer designed for the cleaning of aircraft engine cylinders.

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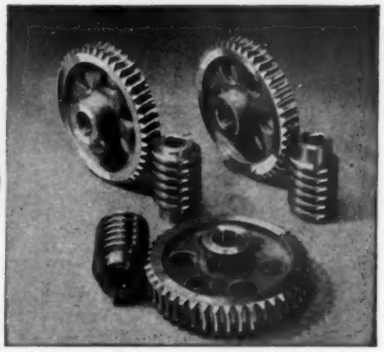

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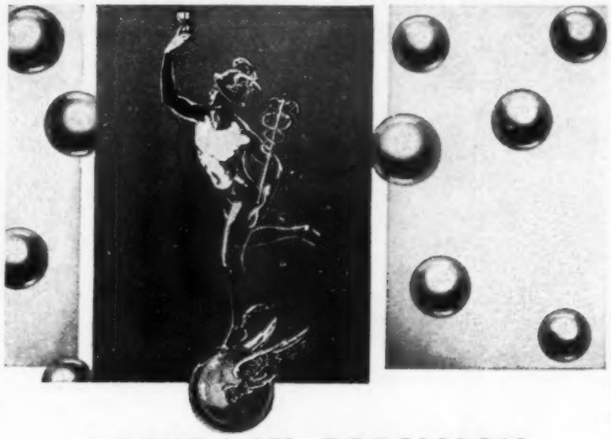

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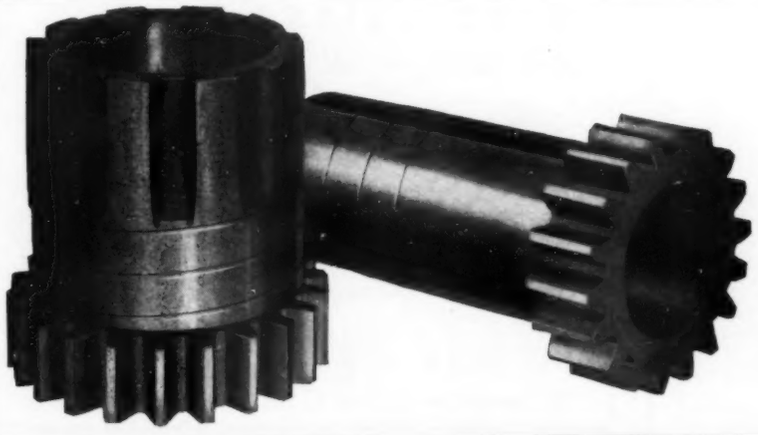

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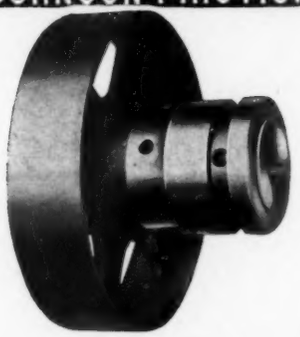

Left — Single Clutch with pulley.

Johnson expanding ring type.

. . for maximum serviceability in minimum space

Below — Double Maxitorq, Multi-Disc Type.

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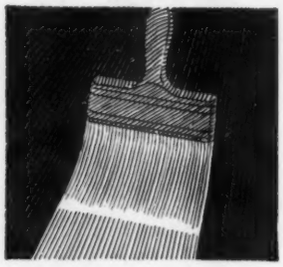
PORTABLE COOLANT PUMPS — "FLO-BAC" PANS, COOLANT FITTINGS AND COOLANTS

DEVOE WALLUSTRE PAINTS

help to "keep 'em seeing"— step-up production



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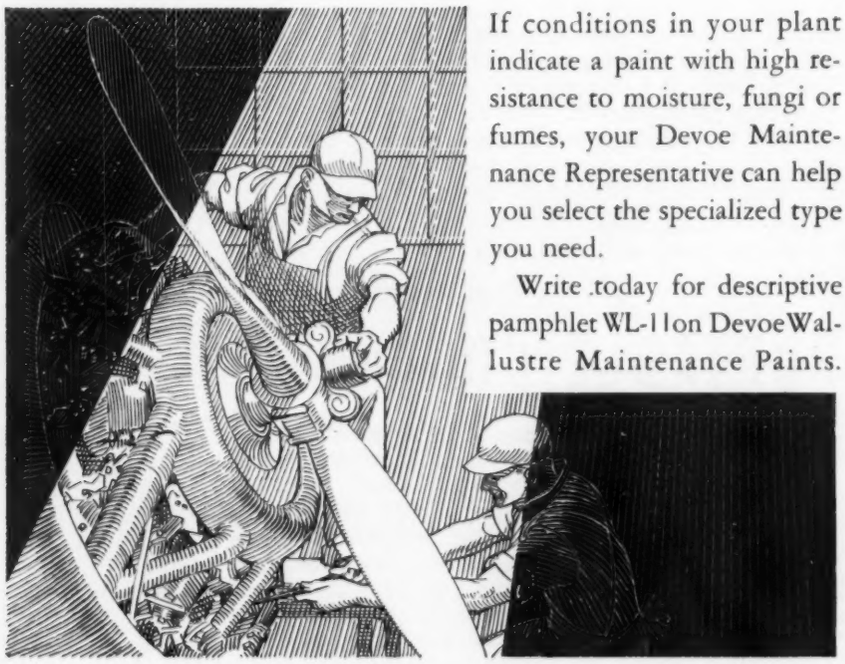

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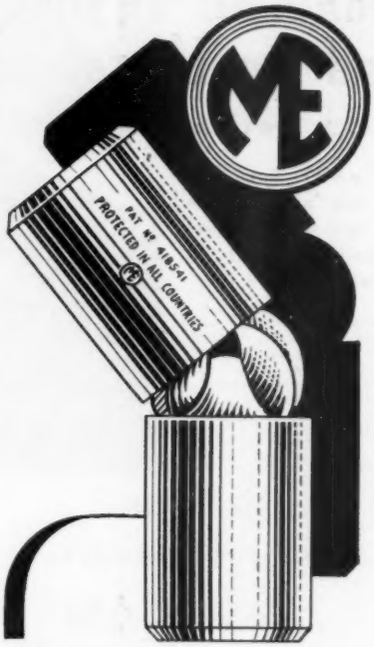

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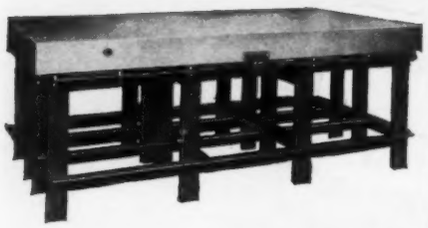

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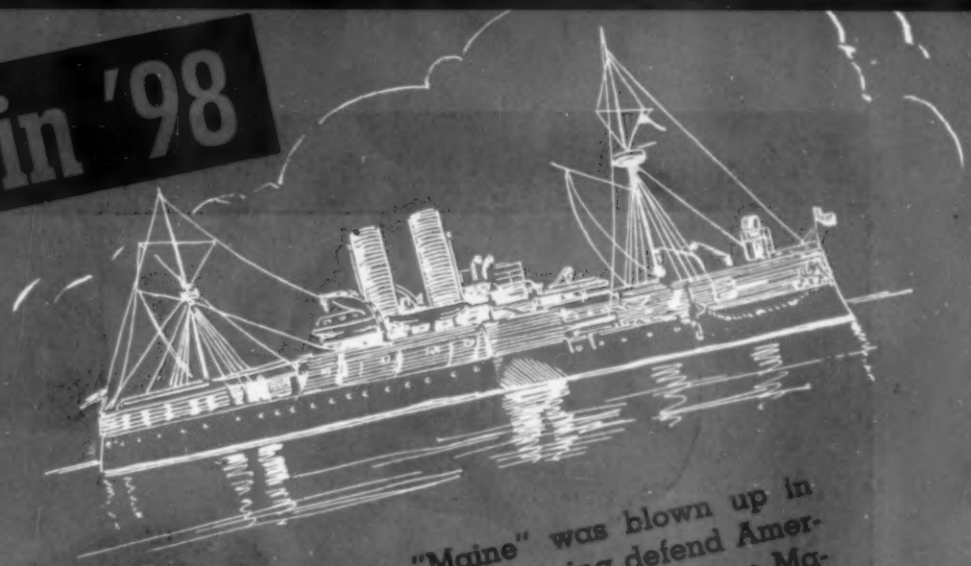

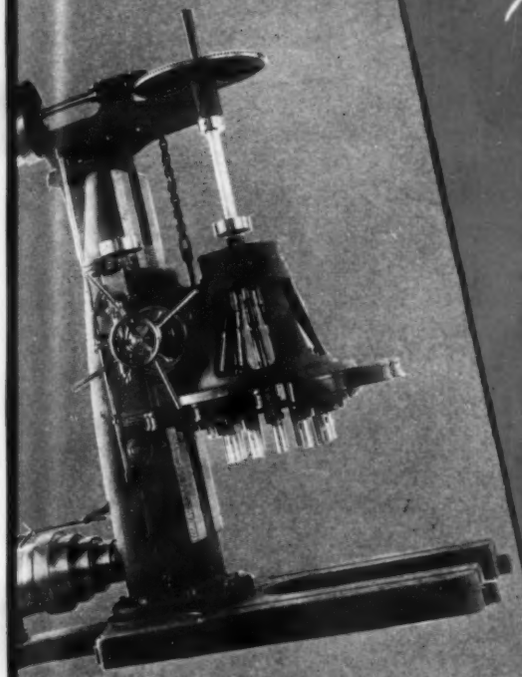

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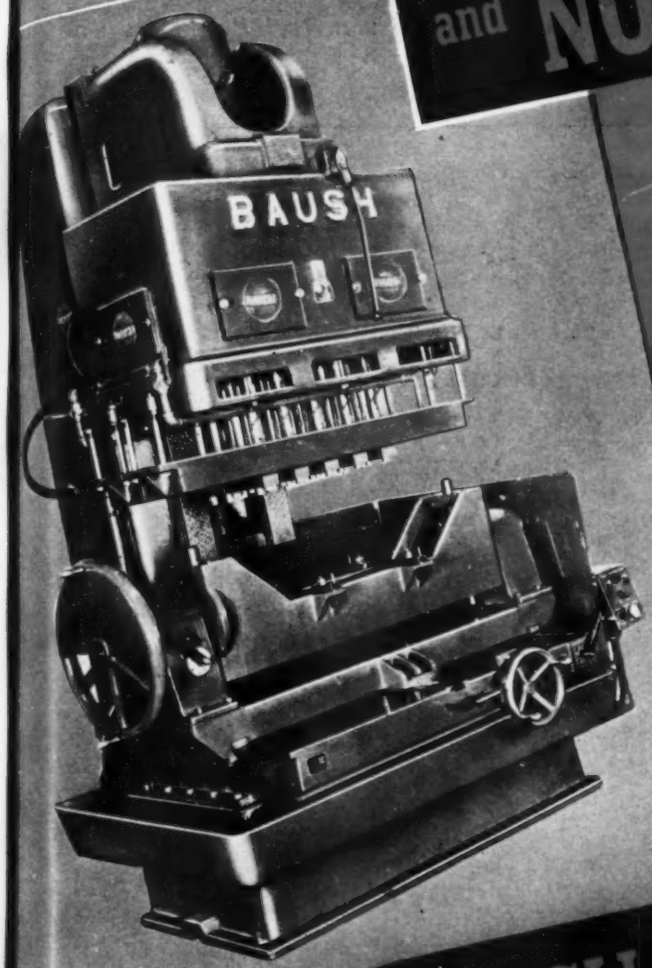

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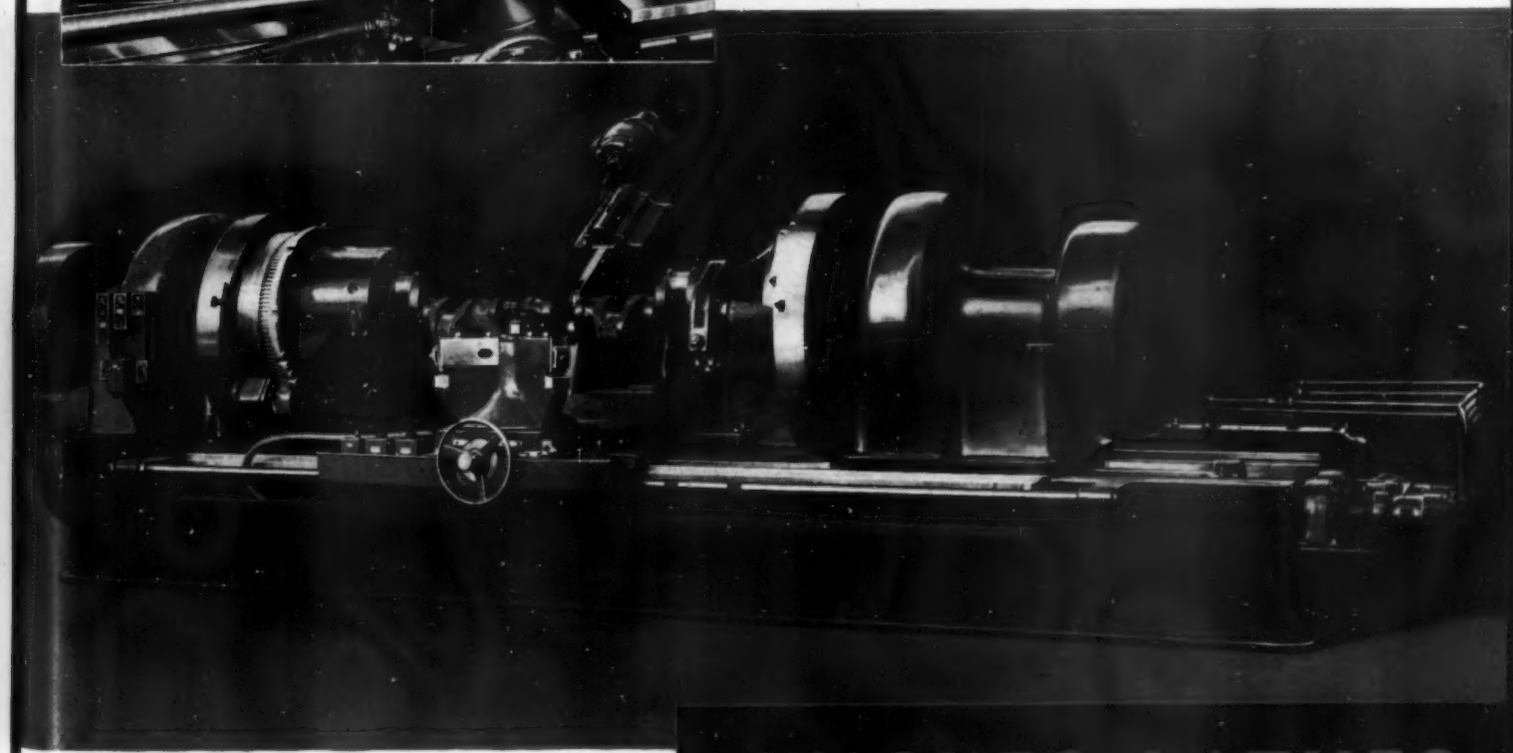
CAPACITIES Wickes Crankshaft Lathes are built in four sizes, 36", 48", 60" and 72". The UH-4 (36") machine is suitable for machining crankshafts having main line bearings and crankpins up to approximately 4" or 4½" in diameter and with strokes up to 7½".

The UH-8 (48") machine is suitable for machining crankshafts having main journals and crankpins up to 6" in diameter and with strokes up to 10".

The UH-60 (60") machine is designed for machining cranks having main bearings and crankpins up to approximately 10" in diameter and with strokes to 14".

All sizes are built with either double end drive or single end drive. The double end drive models machine the intermediate main line bearings and crankpins. The single end drive models machine the main line bearings and the two ends of the crank.

To get into real high-speed production on your crankshafts, it will pay you to operate one of these Wickes Lathes designed expressly for the job. Write today for illustrated Bulletin U-801.



A Wickes Model UH-8 (48") Universal Crankshaft Lathe, double end drive type. Inset (above) shows back roller rest in position for supporting a long crankshaft while machining intermediate crankpin.

WICKES LATHES

CUT COSTS · SPEED PRODUCTION

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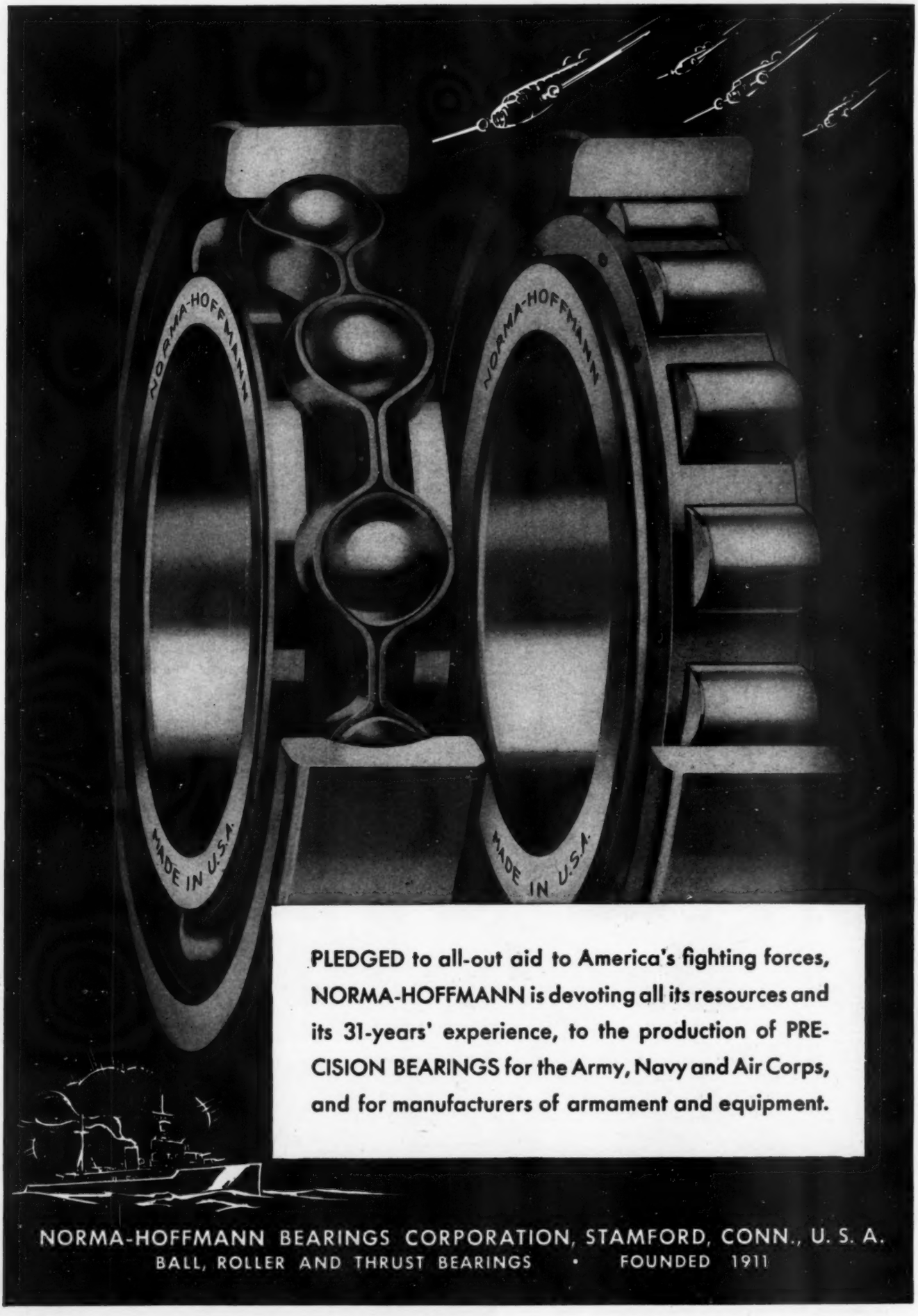
Crankshaft Turning Equipment · Double End Boring Lathes · Heavy Duty Engine Lathes · Special Production Lathes · Blue Print Machines



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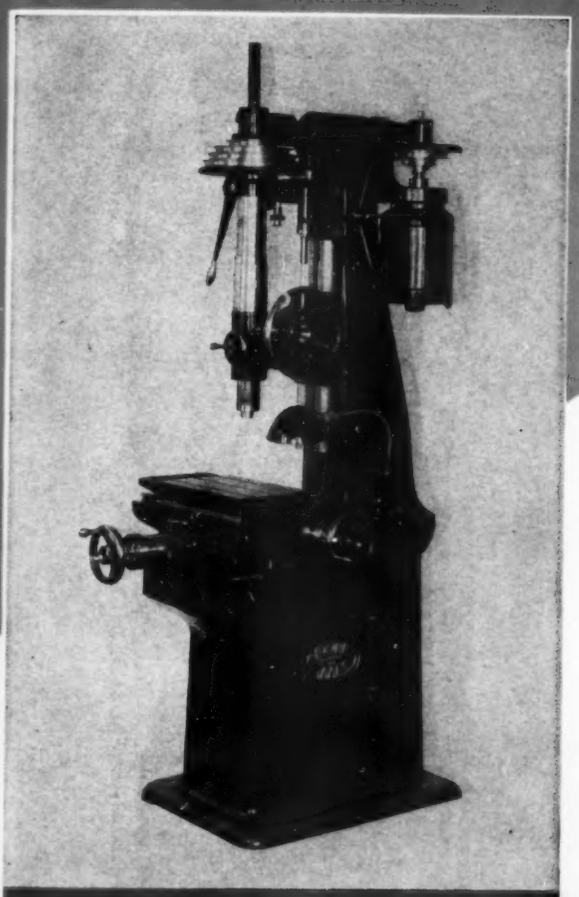
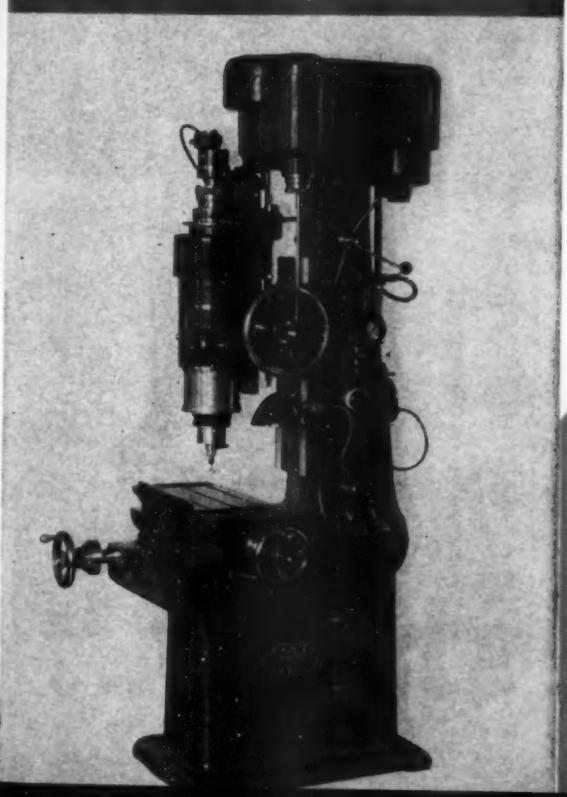
Moore JIG BORER Moore JIG GRINDER Companion Machines

indespensable to precision tool and die work...





FIRST: BORE HOLES ON A MOORE JIG BORER

The ideal machine for small and medium-sized parts. Die sections, gage bodies, master plates, jig bodies—all can be bored with maximum accuracy and convenience. Holes in parts to be hardened should be left .005" to .010" undersize for grinding.

THEN: RELOCATE AND GRIND HOLES TO SIZE ON A MOORE JIG GRINDER

The outstanding new development in toolroom equipment. Grinding of holes corrects their location, removes surface decarburization, produces a new, clean surface with excellent finish. Such conditions, heretofore impossible to attain, can now be produced with ease on the Moore Jig Grinder.

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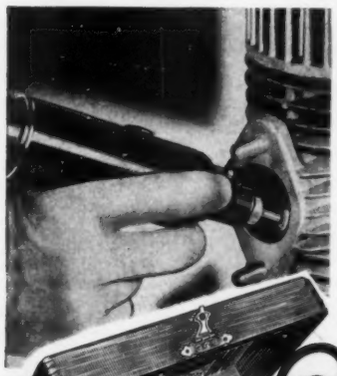
DREMEL MOTO-TOOLS SPEED UP WAR PRODUCTION



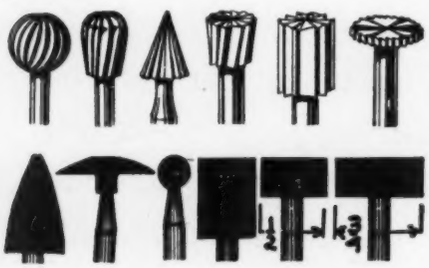
Dremel Moto-Tools are speeding up war production in defense plants from coast to coast. These rugged tools tackle grinding, routing, buffing and finishing jobs with speed and precision . . . faster and easier, especially in close quarters . . . in hard-to-get-at places.

A Dremel Moto-Tool has a shock-proof bakelite housing, oil-sealed bearings, and a balanced armature to eliminate vibration and produce finer finished surfaces. It weighs only 13 ounces . . . can be hooked up to any AC or DC outlet. Used in America's leading arsenals of democracy . . .by General Electric, Westinghouse, Remington Arms, Ford, Nash-Kelvinator, Consolidated Aircraft, Northrop Aircraft, and many others.

Below: Tool makers find Moto-Tool's sensitive, finger-tip control indispensable when shaping intricate or irregular metal dies. For grinding or cutting with steel accessories . . . it can't be beat for convenience and adaptability.

Above: Moto-Tool is ideal for getting into close quarters, grinding, buffing and finishing to required specifications. Can be used for metal, wood, plastics, porcelain, glass, and other materials.

This complete Moto-Tool kit has accessories for all types of grinding, buffing and finishing operations . . . with steel cutting tools and the best abrasives. Consists of 1 Model 2 Moto-Tool with 3 collets:— 1/8", 3/32", and 1/16", 4 Emery Wheel Points, 1 Dressing Stone, 8 Carving Cutters, 1 Steel Saw, 3 Bristle Brushes, 1 Steel Cleaning Brush, 1 Screw Mandrel with Sanding Discs, and 1 Shoulder Mandrel, one 1/2" Drum Sander. Packed complete in sturdy felt-lined hardwood cabinet case . . . $23.50. Dremel No. 2 Moto-Tool only . . . $16.50.



Use genuine Dremel accessories for precision work. Steel cutters (above) can be used for carving, routing, or engraving wood, bakelite, plastics and soft metals. — See catalog. Dremel points (below) are made of the best abrasive in proper grit and grain for grinding practically any kind of material.

10 DAY TRIAL

Try Moto-Tool for 10 days in your own shop. See how versatile, how indispensable it can become to fast, accurate work. Order from your supply house or send direct.

DREMEL MFG. CO., Racine, Wis.

USE THIS COUPON TO ORDER

Dremel Mfg. Co., T-472-H, Racine, Wis. We would like to take advantage of your ten day trial order. Enclosed find our purchase order for the following—

- ☐ Complete ($23.50)
- ☐ Moto-Tool Model 2 ($16.50)
- ☐ Catalog of Dremel Tools and Equipment

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3 Years' Service Crowded into 1 - and RBC BEARINGS KEEP ROLLING . . .

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April 3, 1942

NIAGARA ESTABLISHED 1879

Roller Bearing Company of America
Trenton, New Jersey

Attention: Mr. J. Kelvin Stahl

Gentlemen:

We would like to have an additional copy of your latest catalog and data book No. SP-17 to facilitate our work in this department. We find your catalog helpful because of its comprehensive data on your complete range of sizes.

Your bearings are component parts of our sleeve clutches which are used on Niagara Presses and Shears. "RBC" bearings are also used at certain points in our latest type power squaring shears.

I might add that we have been "RBC" users for about five years and have found their performance satisfactory, both in the past and under today's 24 hour a day wartime service which crowds three years of operation into one.

Very truly yours,

NIAGARA MACHINE & TOOL WORKS.

G.E. Munschauer,
Chief Engineer.

The Niagara Power Squaring Shears, illustrated here, may suggest a use for RBC Roller Bearings where high load carrying capacity and anti-friction qualities are of vital importance. Our engineers will be glad to co-operate in connection with the application of roller bearings to any type of machinery or industrial equipment.

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ROLLER BEARING COMPANY of AMERICA

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HELP

FOR MECHANICS' BUSY FINGERS

Most mechanics prefer to run a cap screw down as far as possible with their fingers before applying a wrench. So, to provide a better grip, for years we have knurled the heads of "Unbrako" Socket Cap Screws. Even when screws are oily or fingers greasy, there is no skidding or slipping—lost time and wasted motion are eliminated . . . production is speeded up.

Don't overlook this aid to production . . . it costs no more. The "Unbrako" Catalog gives sizes and details . . . send for a copy.

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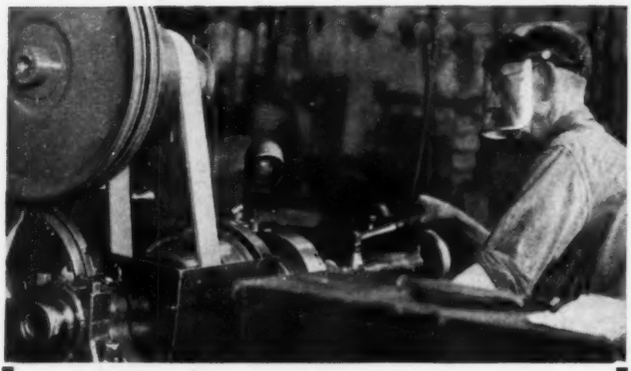
Knurling of Socket Screws originated with "Unbrako" years ago.



SHORT ON MACHINES?

Here's one way to boost the *capacity* of those you have!

Let TANNATE leather belting help keep your machines on the job.

TANNATE maintains top speeds even at peak loads . . . grips tightly; delivers more power; keeps machines running smoothly with fewer shutdowns for drive maintenance. High temperatures, moisture, machine oil and many weak chemicals have little affect on TANNATE leather belting. And TANNATE's great strength assures long belt life and low yearly belt costs, too.

You'll see production schedules take a turn upward. You'll get more uniform work, less spoilage, fewer shutdowns, reduced unit cost with TANNATE. Why not give it a trial in your plant?

Ask for our folder "Better Service Belt Hints". It tells how to keep belts on the job with A-1 efficiency.

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"1-A" Selectees at the Draft-ing Board

FIRST TO COME UP when drafting a new machine: (1) how to save material; (2) how to reduce the size and weight of component parts. Hollow Screws help *materially.*

"First selectees" in Hollow Screws are the cold-drawn and *pressur-formd* ALLENS. Because these processes bring out the strongest attributes of hollow screws, — the ultimate in holding-power; the utmost strength for the *size* of screw.

Thirty-two years of hollow screw specializing are "inducted" in Allen's service *this* year — the time of supreme test. Thirty-two years of plant development are "peaked" to provide needed *millions* of "Allens" each week.

Your local Allen Distributor will secure for you the largest shipments compatible with your priorities and our intensified production-effort.

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HARTFORD, CONNECTICUT, U. S. A.

MANY LEADING INDUSTRIES are reducing waste... saving tools... speeding production with

The DISSTON CONSERVATION CONTROL PLAN

CONSERVATION ★ SERVES EVERYONE ★
HENRY DISSTON & SONS, INC. ESTABLISHED 1840 REG. U.S. PAT. OFF.

Less waste of essential tools and materials, greater output, and longer life from equipment are the order of the day in all wartime effort.

In many of the nation's leading industries from coast to coast, Disston Conservation Control Cards are helping to lengthen the life of tools, reduce breakage, save time and accelerate production. These cards—offered *without charge* as part of the Disston Conservation Control Plan—can be applied in your plant to improve workmanship, simplify supervision, speed training and conserve critical materials.

Disston Conservation Control Cards contain carefully prepared information on 34 different types of cutting tools. They cover the proper selection of tools, common faults in use and their correction, and expert advice on the adjustment, care, repair and replacement of each type.

You can get Disston Conservation Control Cards on request—whether or not you are a user of Disston products. Send for this practical aid to more efficient wartime production today! Write to Henry Disston & Sons, Inc., 820 Tacony, Philadelphia, Pa., U.S.A.

• **A BOOKLET** tells you all about the Disston Conservation Control Plan—and contains reproductions of the Control Cards and an order blank. Send for it now!

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Blades are hardened on the tooth edge only and the saw is designed for operating at low speeds. Teeth are milled and accurately set by machine. Two types of set: Raker Set, in all widths and number of teeth per inch except 32, for general metal cutting, especially steel; Group Set, is furnished only in 32 teeth per inch.

OUT OUR WAY
BY J. R. WILLIAMS
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WHAT AGAIN "?"
THE OLD BULL SURE IS WEARIN' DOWN THE DOORSILL O' THE FRONT OFFICE LATELY--
YEH, WHAT WID DEM GOVERNMENT MEN AN' POST-WAR PLANNIN' I BET HE AIN'T SEEN THE OTHER END O' THE SHOP IN A WEEK!
J.R WILLIAMS

Let's Give the 'Old Bull' Credit...

THESE are trying days for every one of us. We must all give more of our time and efforts than ever before if we are to share in the ultimate victory . . . and reap the benefits of a sound post-war economy. We can do *more* than keep up our tremendous production drive. We can, and should, look ahead . . . and lay plans *today* to meet the economic and production problems that will come when the war is won. This is our obligation to ourselves . . . to Democracy . . . and to everyone helping to preserve it.

(*Below*) A few of the many thousands of our precision-made parts that help "Keep 'em flying and fighting."

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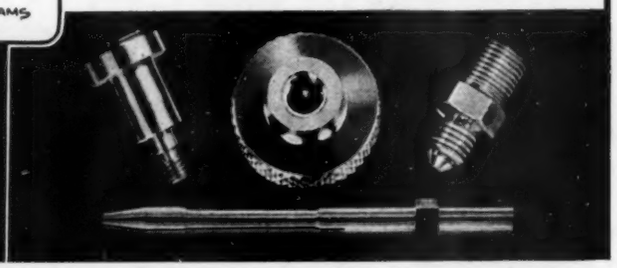

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OTHER MAC-IT PRODUCTS INCLUDE:

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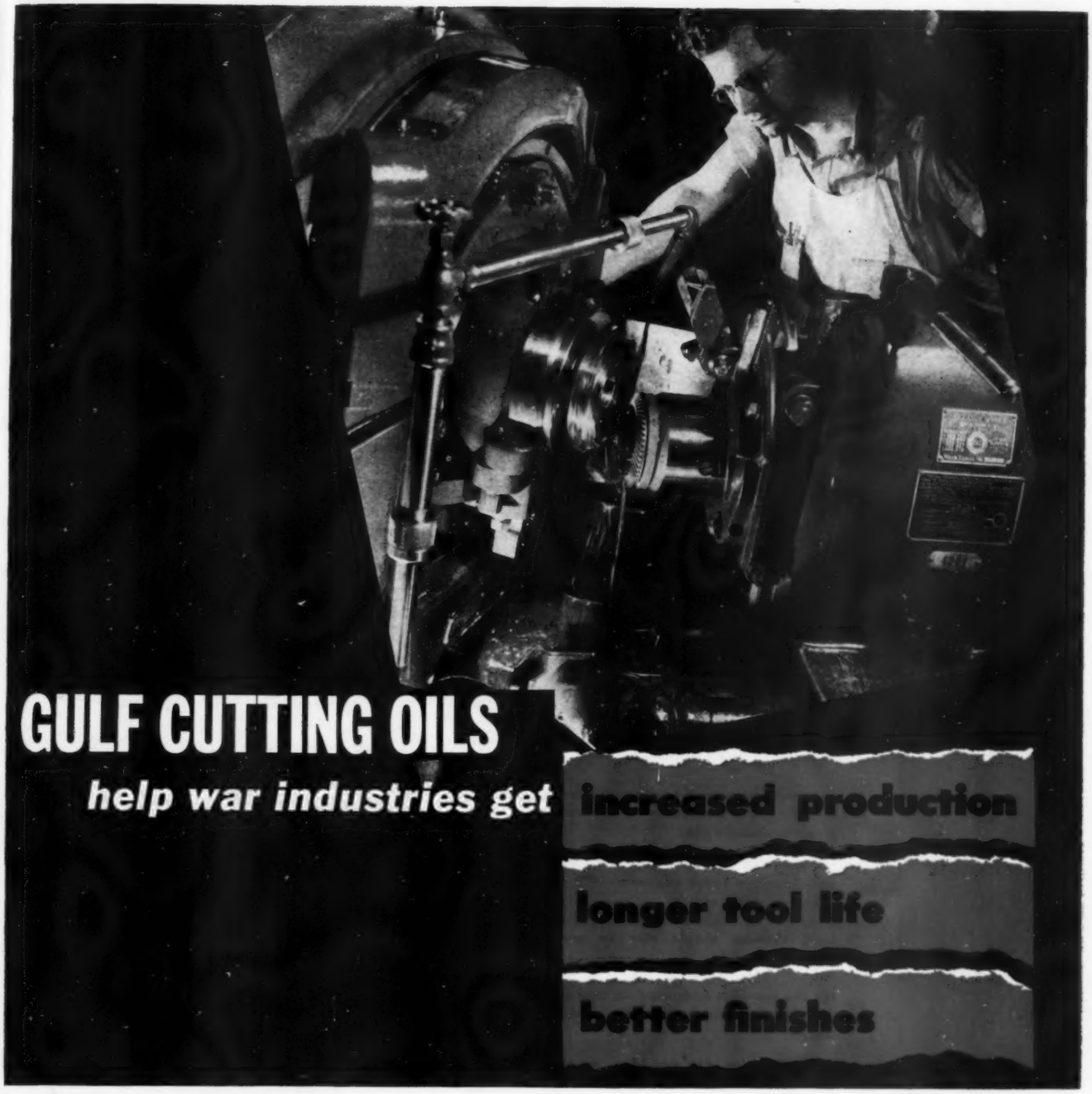

ENGINEERED to meet the production requirements of *today,* improved Gulf Cutting Oils are helping set new standards of machine tool performance in many plants!

Combining the best possible lubrication and effective cooling in the cutting and tool-chip contact areas, Gulf quality cutting oils are contributing to faster and more accurate machining, longer tool life, and improved finishes on the work. Production increases in many cases are truly remarkable!

A new booklet, which provides the facts on improved Gulf Cutting Oils — plus a useful 24-page Machining Guide section—is now available to plant men. Write for your copy today. Gulf Oil Corporation, Gulf Refining Company, Gulf Building, Pittsburgh, Pa.

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FORD TRIBLOCS withstand abuse amazingly well—but this is certainly no time to abuse *anything* made of critical materials. Like any other precision-made machine **FORD HOISTS** will give more efficient service for a longer time if properly maintained. In **FORD HOIST** maintenance lubrication is perhaps the most important single factor—so here are 5 points on lubricating **FORD TRIBLOCS:**

1. **The gear cover should be removed occasionally and a small quantity of heavy graphite grease added.**
2. **The load chain should be lubricated frequently with a heavy oil, particularly at engaging points of links.**
3. **Load sheaves should also be well greased.**
4. **Oil the bearings frequently so that no bearing will run dry and cause excessive wear.**
5. **Five oil holes are provided in the TRIBLOC and these should be filled frequently.**

When given intelligent care, thoroughly lubricated and cleaned at intervals, **FORD TRIBLOCS** will remain efficient under the hardest usage for a long time. Your **FORD HOIST** can be one of your best friends during this production emergency. Take care of it.

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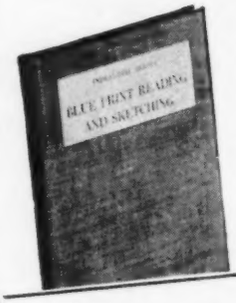
It will pay you . . .

—to know how to make mechanical drawings, sketches, and blueprints

—to be able to read them, do shop and inspection work from them



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Written for the practical man in simple, concise, practical language; gives thorough drill in the making of sketches and the reading of blue prints and drawings of all kinds. Contains examples for the machinist, construction man, electrician, power plant operator, etc. Familiarizes the reader with shop terms and the language used in production, and trains him to think accurately and precisely in terms of industrial drawings.

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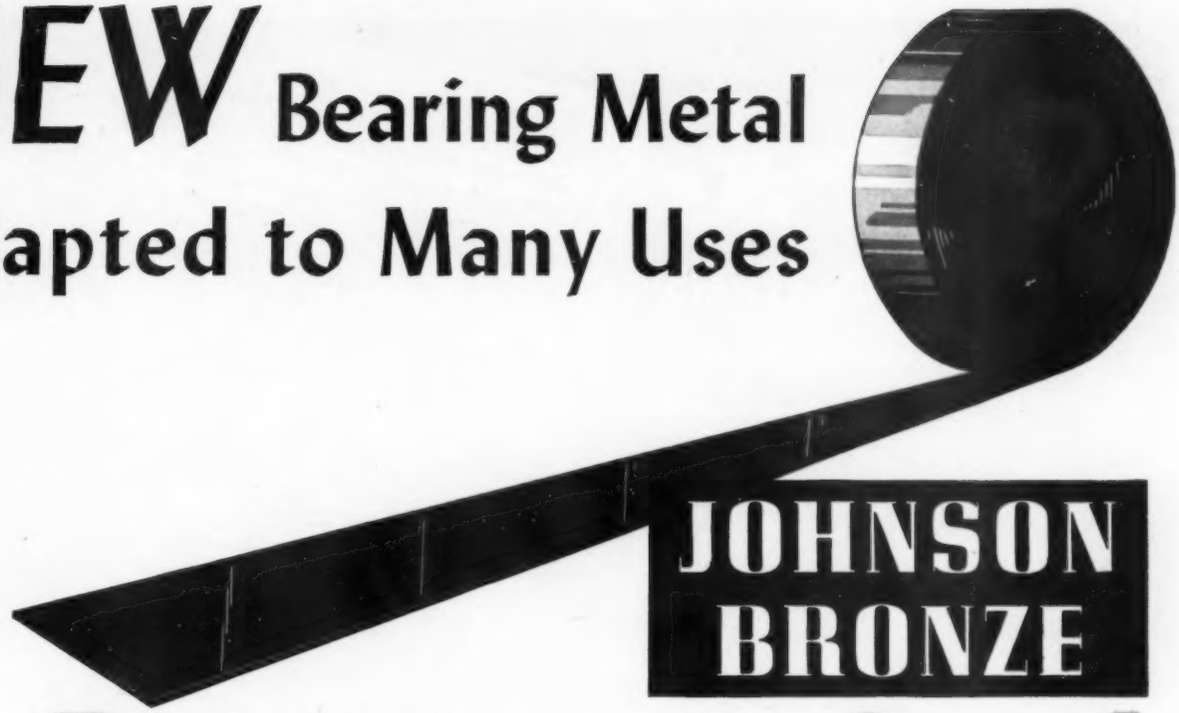

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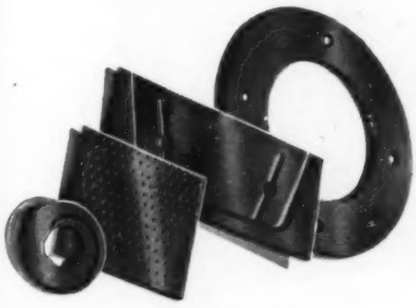
The alloy of the bronze—S. A. E. 64 combines all of the necessary elements to insure outstanding bearing performance in practically any application.



Washers, flat pieces or shapes can be produced exactly to your specifications. This includes oil holes, grooves, slots, indentations, etc.

Pre-Cast Bearing BRONZE ON STEEL was originally developed for thin wall, sleeve type bearings and bushings. Equipment manufacturers were quick to realize that the combination of the bearing qualities of bronze and the strength of steel enabled them to increase speeds and loads . . . to gain longer life and smoother operation . . . greater resistance to shock and to wear. Millions of BRONZE ON STEEL bearings in constant operation prove this point.

Manufacturers are now finding many additional applications for *Pre-Cast Bearing* BRONZE ON STEEL. It is an ideal metal for washers, stampings or other flat pieces such as guide strips on presses and shapers, door slides, brakes, etc. For such applications, we can furnish BRONZE ON STEEL in rolls up to 400 feet in length or as flat strips either plain or graphited. The maximum width is 5½ inches with their thickness, 1/32", 1/16", 3/32". BRONZE ON STEEL is an ideal substitute for rolled bronze. Write today for the complete story on BRONZE ON STEEL. It's FREE.

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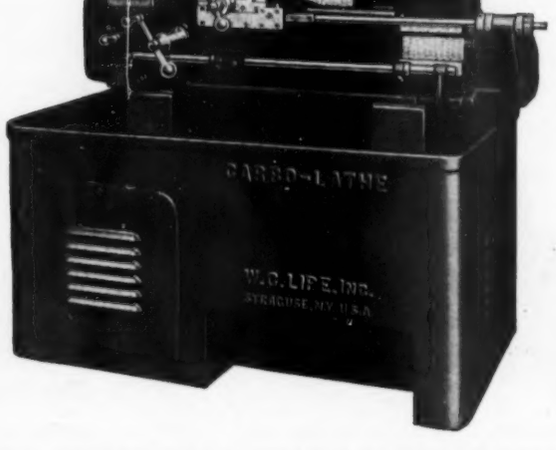
. . . Our Answer to the Axis Combat Teams!

● Mechanical Blitzkrieg introduced the combat team, the balanced combination of bomber and tank, of infantry and armored car. And now on the industrial front it's the Lipe Production Team, the balanced combination of fully automatic and manual carbo-lathes. Lathes that fit high-speed carbide-tool cutting into a completely rounded procedure . . . obtaining maximum output with the right machines for the job, and with minimum investment and labor cost. Write for details.

The LIPE Carbo-Matic Lathe

100% HYDRAULIC CONTROL

Entirely automatic, requiring minimum skill on the part of the operator, this lathe is so powerful and so rigid that it takes deeper cuts through the toughest alloys with amazing speed and precision. It's the anchor machine in any production program, a lathe that turns to four decimal accuracy . . . with no out of round . . . no out of true . . . and worth while reduction in tool wear and breakage. Hydraulic control governs holding equipment, longitudinal and cross feeds and tailstock quill.



The LIPE Carbo-Lathe MECHANICAL CONTROL

Semi-Automatic. Provides the high spindle speeds for efficient, low-cost turning of die castings, plastics and other fast-cutting materials . . . plus the rigidity and smoothness of power and feed to "hog off" tough alloy steels to rough-grinding tolerances. A lathe with a new, non-distortion, trussed-box base to assure economy of tool wear, tool breakage and part spoilage.

MORE THAN A HALF CENTURY OF PRODUCTION MACHINE AND MACHINE-TOOL MANUFACTURE

LIPE-ROLLWAY CORPORATION

Syracuse, N. Y.

DOUGLAS AIRPLANE PARTS *machined with "Defiance" Accuracy*

The view above illustrates a typical precision aircraft operation on the Defiance Horizontal Boring Mill. The photograph is from one of the Douglas Aircraft plants, and shows the method used to machine a hole within very close aircraft limits through two sections of a vital part. Both parts are clamped in the fixture so that a shell end mill can be run through for roughing; a second shell end mill obtains approximate size; then a long bar with four cutters, guided at the front of the fixture, finishes the two pieces straight within a close tolerance so that the parts will fit perfectly upon assembly. The photo at the right shows another Douglas aircraft application of the Defiance precision Boring Mill.

Bulletin and full information upon request

Definance Horizontal Boring Mills feature OUTBOARD BEARINGS as an integral part of the Machine; close accuracy of supports is thus assured. Provision for adjustment makes for permanent accuracy. Fifteen outstanding features put these Machines in a class by themselves.

DEFIANCE MACHINE WORKS, INC.

DEFIANCE, OHIO

Makers of Precision Machinery since 1850

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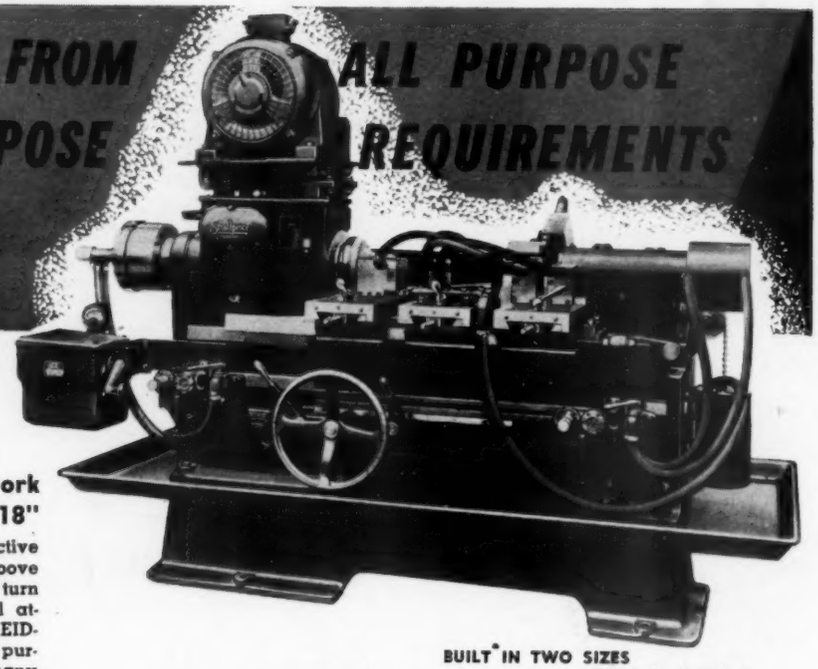

MULTI-TOOL PRODUCTION LATHE

Relieves bottlenecks on armament work up to 58" between centers and 18" swing. This powerful, versatile, highly productive lathe will rough and finish turn, face, bore, groove form, wave, taper turn, vee, skim turn, profile turn and groove. Unit design together with special attachments make it possible to transform the REID-SMALLPEICE LATHE from all purpose to single purpose requirements quickly and easily. It offers many machines in one, thereby providing the means for keeping production moving without delays incident to installing other machines to do the same work.

BUILT IN TWO SIZES

	6 W. S. L.	9 W. S. L.
Swing over bed	12"	18"
Between centers	18"	22"
Admits between centers (long bed)	30"/42"/54"	40"/58"
Spindle Speeds	10	8
No. of feeds	10	15
Floor space	5½"x3'0"	7'8"x4'0"

WRITE FOR ILLUSTRATED BULLETIN, GIVING COMPLETE SPECIFICATIONS

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WILLARD *Spring* TOOL HOLDERS

...modern aids to speeded-up war production!

These time and work-saving tool holders are especially adapted to repetitive, fast, precision production work. Their ever-widening acceptance in plants busily engaged in war work is outstanding recognition of their ability to eliminate chatter and protect cutters from breaking as well as to insure against damaged work.

WILLARD TOOL HOLDERS are available for every cutter need. Prompt deliveries.

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Forming Tool Holders, Threading Tool Holders, Cutting-off Tool Holders, Threading and Forming Tool Holders.

Threading and Forming Tool Holders—universal—can be used for fine or coarse threading without danger of chatter or tool marks. Forming tools in this holder produce work of uniform high quality and more pieces per grind.

Threading Tool Holders — available in straight and right-hand offset types. No fitting to gauge when grinding; no adjustment in tool post after grinding; threads close to shoulder; produces smooth accurate threads.

Product of AUTO-ORDNANCE CORPORATION

TRADE MARK Thompson REG. U.S. PAT. OFF.

1437 Railroad Ave., BRIDGEPORT, CONN.

HOW AND WHY
WILLIAMS' TOOLS AID WAR PRODUCTION

J. H. WILLIAMS & CO., *Drop-Forgings and Drop-Forged Tools*, BUFFALO, N. Y.

DATA ON WILLIAMS' BORING TOOLS

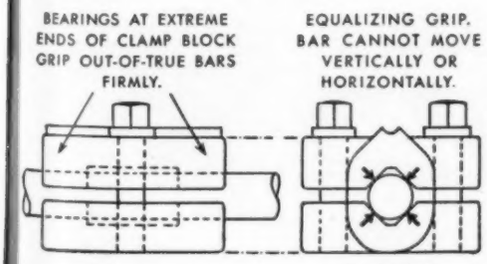
For those lathe operations involving boring and internal threading, Williams' Tools incorporate certain features which tend to conserve man-hours, improve output, and to reduce the number of rejects, particularly with semi-skilled and inexperienced operators.

Sleeve Bar

Plain Bar

Williams' Series 80 Boring-Tool Holder

Williams' Boring-Tool Holders (80 series) are designed so that *each* holder will accommodate *several* sizes of bars and so that commercial forms of bar steel are adaptable for either bars or cutters without machining. Adjusting sleeves or bushings are not used with this holder so there are no loose parts to become misplaced or lost. The "V" Block clamping arrangement, sketched below, grips even undersize or out-of-round bars firmly at four points, thus preventing tool chatter.


BEARINGS AT EXTREME ENDS OF CLAMP BLOCK GRIP OUT-OF-TRUE BARS FIRMLY.
EQUALIZING GRIP. BAR CANNOT MOVE VERTICALLY OR HORIZONTALLY.

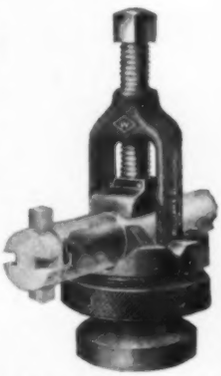
Simplicity of design and sufficient stability to assure freedom from tool chatter are essential features in Tool-Holders for war production.

The Sleeve Bar regularly furnished accommodates either a straight or angle cutter in the *one* head, so there is no extra head to be misplaced while the other is in use. A Plain Bar, as illustrated above, can also be supplied if specified. Series 80 Holders are made in 5 sizes covering bar diameters from 3/16" to 1-1/8".

Williams' Light Boring-Tool Holder

For tool room use and all small work—including turning, as well as boring and threading—Williams' Light Boring Tool Holder incorporates certain distinctive features. In boring and internal threading operations each holder will take several sizes of bars. Easy, rapid adjustment is assured with the knurled adjustment screw. When used as a Turning Tool Holder the offset shank makes it reversible for right and left hand work. This Holder is made in 3 sizes accommodating bars from 1/8" to 7/16" in diameter.

Williams' Adjustable Boring-Tool Post



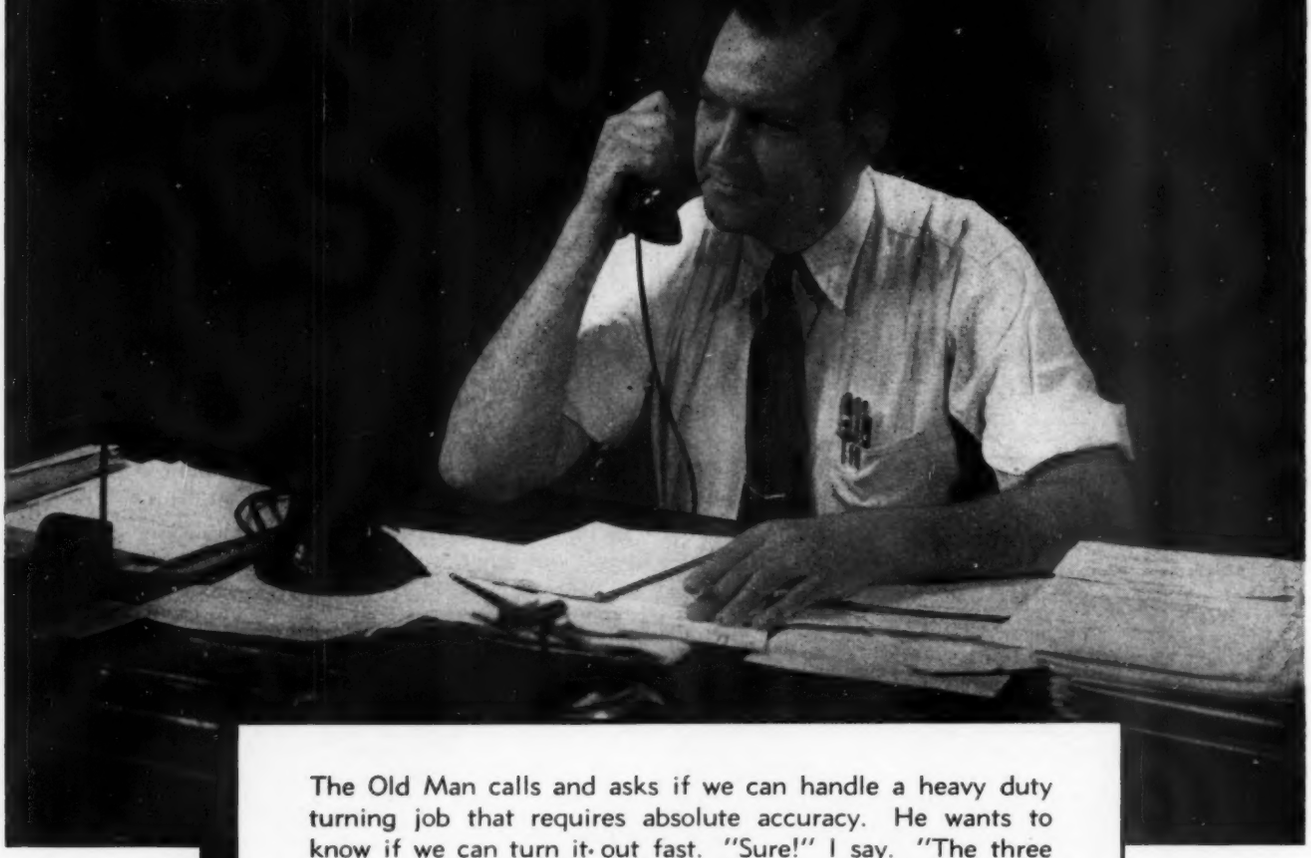
The Williams' Adjustable Boring-Tool Post, with its long range center adjustment, is designed to accommodate many sizes of bars on various types of lathes. Easy, quick, vertical adjustment is accomplished by first selecting the proper bar recess in the slotted collar and then rotating the knurled ring which raises or lowers the bar to the correct height. Tightening the set screw in the head of the post tightens the whole device instantly, giving an extremely rigid tool. For all phases of boring and internal threading this vertical adjustment permits proper centering rapidly and assures perfect performance. The "V" block bar clamping construction grips the bar at four points which eliminates vertical or horizontal movement, thus preventing chattering.

Made in 4 sizes for bars 1/2" to 2-1/4" diameter.

WILLIAMS
SUPERIOR DROP-FORGED TOOLS
Headquarters
for over half a century for
DROP-FORGINGS and DROP-FORGED TOOLS

Sold by Leading Industrial Distributors Everywhere

SURE WE CAN DO IT.... WE'RE AXELSON LATHE EQUIPPED!



The Old Man calls and asks if we can handle a heavy duty turning job that requires absolute accuracy. He wants to know if we can turn it out fast. "Sure!" I say. "The three Axelson lathes in this plant can turn out a job, big or small, right on the nose for tolerance . . . and do it quick. You get the contract, Boss—and we'll deliver—on time!"

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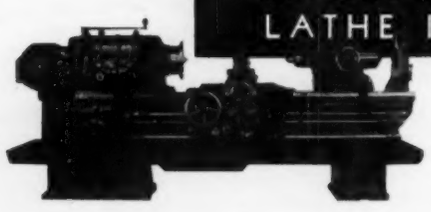
50 Church Street, New York **3844 Walsh Street, St. Louis**

Axelson Lathes are manufactured in 14", 16", 18", 20", 25", and 32" sizes. Your post card will bring complete details.

AXELSON 50TH YEAR 1892 1942

BEFORE YOU BUY ANY LATHE INVESTIGATE **AXELSON**



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Many "Sea Going" Specifications

Century Motors are playing their part at sea as well as ashore in various climates, from the wintry seas of Iceland to the humid climate of the South Pacific Ocean.

Century Motors for such vital uses are available:

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4. And as motor driven AC and DC generator sets—for normal low, standard, and high voltages—1/20 to 400 horsepower, 50 watts to 200 kilowatts.

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The dependable performance for which Century Motors are famous is serving American Wartime industry, too, in thousands of industrial applications. Your nearest Century Sales Engineer will gladly add his extensive experience to help you select the right electric motor. He is on call every day of the year.

CENTURY ELECTRIC CO.
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One of the Largest <u>Exclusive</u> Motor and Generator Manufacturers in the World

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VITRIFIED

. . . *for*

intricate precision grinding or coarse heavy work

Inasmuch as Vitrified manufactures a complete line of Grinding Wheels in numerous grades, grain combinations and bondings, it is merely a matter of selecting the right wheel for the work to be handled.

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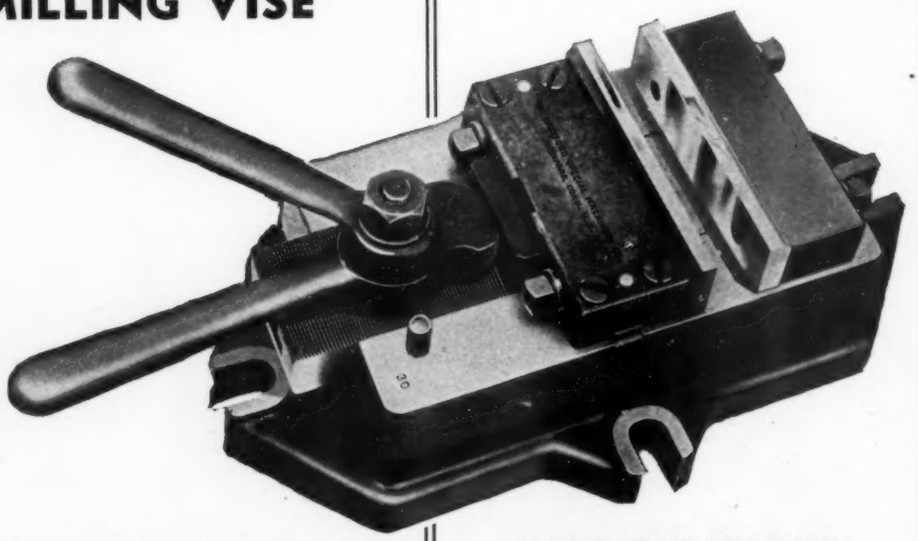
Whether your work involves roughing, finishing, surfacing, edging, or cleaning, hand, automatic or swing grinding, there is a Vitrified Wheel which will give you maximum service at minimum cost.

Why not call in a Vitrified representative to show you how you can make worthwhile savings in your grinding operations?

VITRIFIED WHEEL CO., WESTFIELD, MASS.

The "HARTFORD"
Quick acting MILLING VISE

. . . for today's feeds and speeds in small arms production . . .



This time-tested vise, especially designed for power, speed, accuracy and strength, is a time saver on production milling.

Dual handle operation makes it remarkably convenient to use. The lower cam-faced handle gives a quick opening and quick return. The top eccentric lever-handle provides the locking with a tremendous binding force. Upon releasing the eccentric binding-lever, a quarter turn of the cam-lever opens the movable jaw approximately ⅞". This feature makes chip clearance easy as well as instant release of work.

Another feature of the "HARTFORD" is the movable jaw which is in the position occupied by the fixed jaw in conventional screw-type vises: This construction makes the "HARTFORD" practically unbreakable and assures jaw alignment regardless of how the work is held.

Interchangeability of parts assures ease of making replacements. Screw holes in jaws are interchangeable with those of the No. 2 B&S Vise, so that existing false jaws of this standard may be used without change.

Made in plain and swivel types.

SPECIFICATIONS

Width of Jaw—5"
Depth of Jaw—1 3/16"
Max. opening (Plain Jaw)—2⅜"
Max. opening (Swivel Jaw)—2¼"
Weight—40#
Dimensions (Overall) 13" long—8" wide —5" high

SEND TODAY FOR DETAILS

THE HARTFORD SPECIAL MACHINERY CO.
HARTFORD CONNECTICUT

THE OSTER NO. 601 "RAPIDUCTION" LATHE

Speeds Production of 20mm, 37mm, 40mm Shells

Shell manufacturers were quick to recognize the advantages of the Oster No. 601 "RAPIDUCTION" Lathe.

SIMPLIFIED design; quick adaptability to a wide range of tooling set-ups and operations; availability with optional six position turret or plain saddle and tool holder; optional worm drive or direct drive; and many other features of optional or extra equipment make the Oster No. 601 ideal for manufacturers of 20mm, 37mm, and 40mm shells.

Quicker training of new operators is a big advantage of the No. 601 "RAPIDUCTION" Lathe. Manual operation of the six position turret eliminates the highly skilled set-up work required on the more complicated automatics.

Price? The No. 601 "RAPIDUCTION" (without tools) costs less than $2000 which includes the complete machine with either DIRECT or WORM drive; coolant pump; sheaves and belts; automatic push-out collet chuck; chuck with master collet but less all pads; with ratchet type bar feed; lever feed cross slide; six station manually indexed turret; two speed 1800/3600 R. P. M. 3/4 H. P. constant torque, 220, 440, or 500 Volt, 3 phase, 60 cycle motor, manual speed control and electric brake.

* * * * * * *

Complete details including tooling set-ups, operations, and production estimates on 20mm, 37mm, and 40mm projectiles will be furnished promptly to qualified manufacturers.

OSTER

Let's GO!

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Rush, by return mail ..... copies of Catalog No. 27-A which contains full description and detailed illustrations of No. 601 Turret Lathe.

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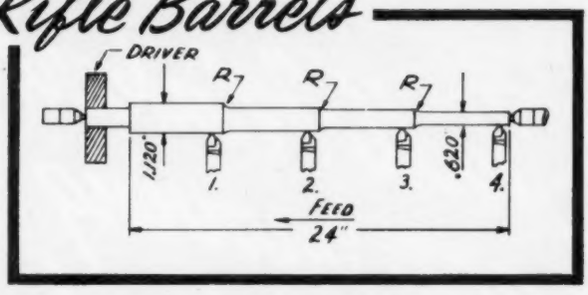
KENNAMETAL* OUT-PERFORMS OTHER CARBIDES IN *Machining Rifle Barrels*

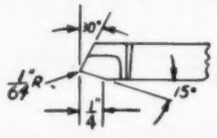


	KENNAMETAL KM	KENNAMETAL K3H	Carbide "B"	Carbide "C"	H. S. S.
SPEED R.P.M.	710	880	600	880	260
FEED PER REV.	.008	.008	.008	.008	.008
CUTTING TIME	1 m. 14 s.	59 s.	.....	.....	4½ m.
FLOOR TO FLOOR	2 m. 14 s.	2 m.	.....	.....	5½ m.
BARRELS PER GRIND	100	100	70 approx.	80	3 to 6

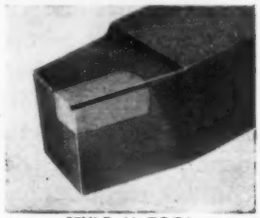
In this set-up for finish turning rifle barrels, tools nos. 1, 2 and 3 turn the radii as they are fed along the barrel. Each tool moves transversely and independently of the others, but all are carried in a common tool block carrier.

As indicated in the table, KENNAMETAL tools finished 100 pieces per grind, as compared to 70 and 80 pieces for ordinary carbides, and 3 to 6 pieces for high speed steel. In addition, KENNAMETAL tools did the work more quickly, and were in better condition after work was completed.

All of these points add up to the fact that KENNAMETAL is more economical, in the long run, than any other material for machining steels. Similar superior performances are proving this every day in hundreds of plants.



SOME OTHER STANDARD KENNAMETAL TOOLS



STYLE 11 TOOL

STYLE 21 TOOL

HOW TO TAKE CARE OF KENNAMETAL

CHANGE TOOLS REGULARLY

Be sure you check tool wear carefully, so that tools can be changed before over-wear. Over-dulling destroys accuracy of work and reduces the number of grinds possible during the life of the tool. Save time and tools by regular sharpening.

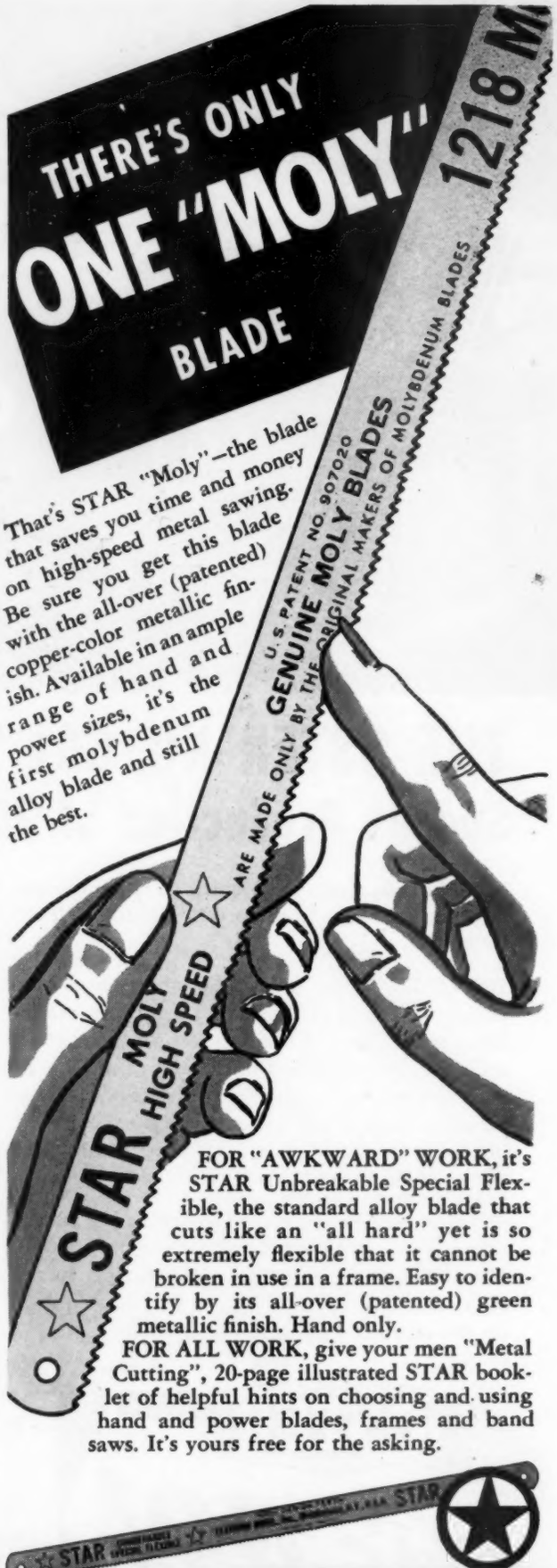
KENNAMETAL THE All American CARBIDE

*INVENTED AND MANUFACTURED IN U. S. A.

McKENNA METALS Co.
103 LLOYD AVE., LATROBE, PENNA.
Foreign Sales: U. S. STEEL EXPORT CO. 30 Church St. New York
Exclusive in Canada and Great Britain

THERE'S ONLY ONE "MOLY" BLADE

That's STAR "Moly"—the blade that saves you time and money on high-speed metal sawing. Be sure you get this blade with the all-over (patented) copper-color metallic finish. Available in an ample range of hand and power sizes, it's the first molybdenum alloy blade and still the best.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GENUINE MOLY BLADES
ARE MADE ONLY BY THE ORIGINAL MAKERS OF MOLYBDENUM BLADES
STAR MOLY HIGH SPEED

FOR "AWKWARD" WORK, it's STAR Unbreakable Special Flexible, the standard alloy blade that cuts like an "all hard" yet is so extremely flexible that it cannot be broken in use in a frame. Easy to identify by its all-over (patented) green metallic finish. Hand only.

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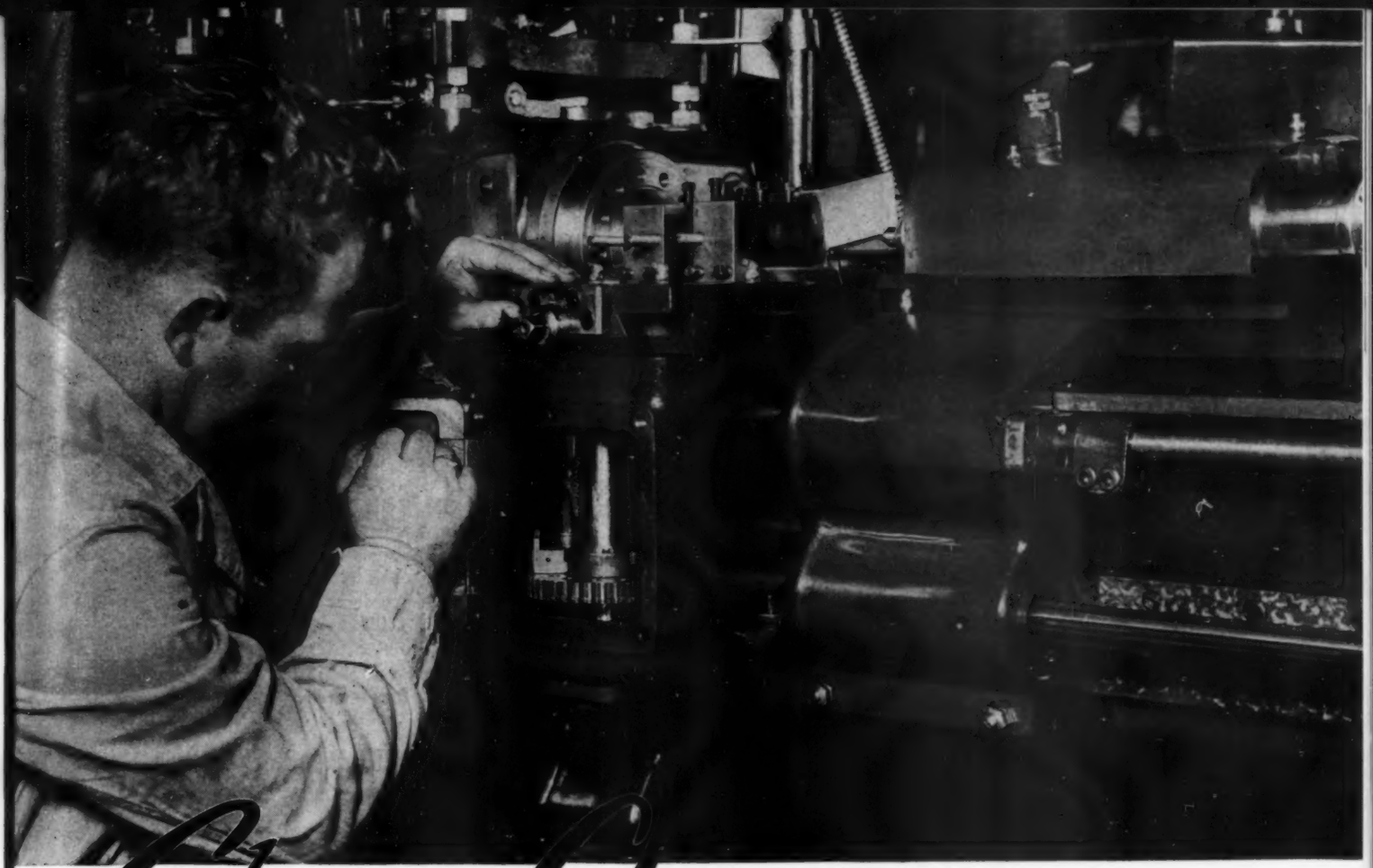


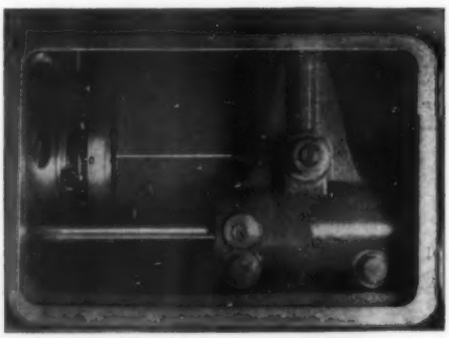
Change Over is a matter of minutes on model LR *Lo-swing* LATHES

War production plants appreciate the speed and simplicity with which Lo-swing Automatic Lathes can be changed-over from job to job. Take Model LR for example: A hinged door provides easy access to the Simplified Change-Over Mechanism located on carriage front. Simply loosen two cap screws and move gear segment to graduation on scale corresponding to desired length of cut in inches. Tighten cap screws and carriage is timed for the job at hand. Cam is standard and does not have to be changed, and since the cycle is closed and locked, machine cannot get out of time.

Rapid traverse adjustment is accomplished with equal ease and speed thru the hinged door at the head end of machine. Loosen two cap screws and slide the ring which is graduated in inches around until the length of cut desired in inches is opposite the zero mark. This automatically positions the rapid traverse control cams so that the remainder of the cycle is completed in rapid traverse. A Rapid Traverse Control Handle, conveniently located just below the door opening further facilitates this adjustment and reduces change-over time.

These and other Lo-swing features, developed in the peace-time past, are now proving their value under the stress of war production.

Close-up view of Simplified Change-over Mechanism.



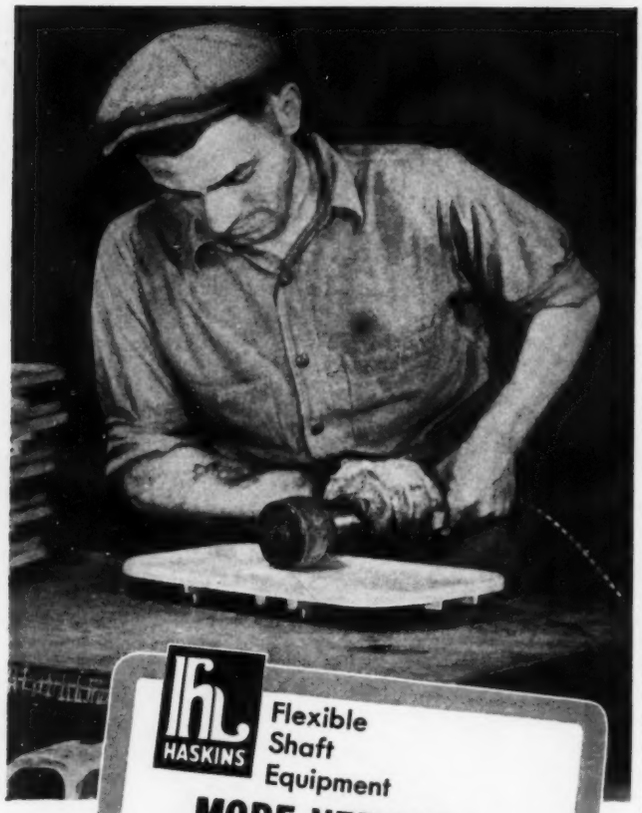
Close-up view of drum cam showing index line and graduated adjustment ring.

Seneca Falls

MACHINE COMPANY

SENECA FALLS, NEW YORK

BUILDERS OF *Lo-swing* LATHES



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For quickest advancement in welding skill . . .

HOW can you most quickly become an expert welder? One answer is to know *whys* and *wherefores*—the metallurgy of welding, weldability of different metals, advantages and disadvantages of different methods, welding fuels, current, machines and materials, and how to handle them, good welds and bad welds, welding costs, and so on—the things that will enable you to work understandingly, overcome difficulties when to "cook-book" instructions fall down, and to tackle special jobs and problems with assurance. . . . And this is just the sort of information, presented so simply that even the beginner can understand it, given in this new book.

back up your practical experience with this thorough, introductory manual of welding fundamentals, equipment, and methods

Just published—James A. Moyer's

WELDING

184 pages, 6 x 9, 97 illustrations, $2.25

THIS book by the State Director of University Extension in Massachusetts brings you the clearest sort of welding information, as used in the well-known shop and trade training programs of this state. Not only practical welders, but also engineers and draftsmen concerned with problems of welding construction, will find in it the comprehensive, up-to-date, soundly technical treatment of welding that will help them in solving their problems.

Modern methods of welding metals, especially iron and steel, by both gas heat and electric current, are covered. You are helped in the selection of welding methods, the safe, efficient handling of welding apparatus, the production of good welds, etc., by 17 chapters of dependable information, clearly presented.

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SNYDER STANDARD DRILLING MACHINE WITH SPECIAL EQUIPMENT SAVES UP TO 50% OF SPECIAL MACHINE COST

The only reason for buying special machines is to gain special production advantages, yet, these advantages may be available to you at savings of up to 50% of special machine cost.

Here's an example. This Snyder standard 10 V 18 drilling machine is a general utility machine, yet, it can be adapted to do many jobs with "special machine" efficiency, speed, and economy of time nd labor, through the use of special fixtures, heads and tools.

The machine shown is used to do a hollow milling job on 20 bosses, using a 5-spindle head and 4 indexes to complete the work cycle.

The index table housing serves as a chip trough and coolant retainer. The standard index mechanism provides the smooth acceleration and deceleration of the Geneva wheel, hydraulically powered from the hydraulic system of the machine itself.

This machine is available with or without special tooling and speed change transmission for single or multiple spindle adaptations. Only the equipment is special, and, with such equipment this machine is the equivalent of a special—at about half the cost of such a machine. This machine can be readily re-tooled for entirely different production by changing the special equipment only.

IF PRODUCTION IS YOUR PROBLEM
write, wire or 'phone

Typical cross section through work and tool

For years we have been helping industry to solve production problems—to produce accurate work at low unit cost. Our clients include the leaders of today—and many others who are heading toward leadership tomorrow. Perhaps we can help you. We invite your inquiries.

SNYDER
TOOL & ENGINEERING CO.
3400 E. Lafayette Ave. • Detroit

designers and builders of machinery for HIGH *production at* LOW *unit cost*

Atlas CATALOG OF WAR EQUIPMENT

FOR

SMALL PARTS PRODUCTION

★

ATLAS PRESS CO.

KALAMAZOO
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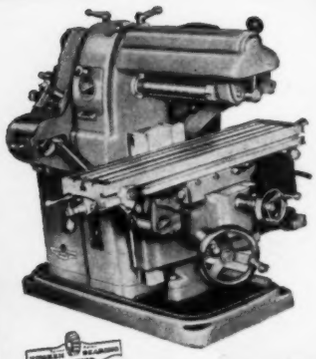
MILLING MACHINES



Compact, powerful, Timken - equipped bench millers for tool room and production. Backgeared power, complete V-belt drive, twelve spindle speeds. Precision - ground table ½" x 16", longitudinal table travel 10", cross travel 3½". Three models available: hand - operated controls, rapid - production levers, or the "Change-O-Matic" for instant selection of automatic feeds.

LATHES

Atlas F-Series 10" backgeared, screw-cutting lathes fill every need as the basic multi-purpose tool for shops and factories. Precision-ground bed, V-belt drive, power cross feed. Available with Timken bearings for high speed production and turret attachments for screw machine work.

SHAPERS

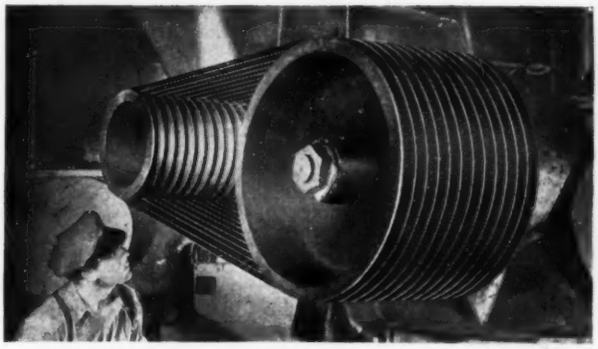
Handle all work within a 7" stroke accurately, economically, quickly. Have crank-type bull-gear drive, Timken tapered roller bearings, 4 speeds, 5 automatic cross feeds, complete V-belt drive. Operate on ½ H.P. 1740 R.P.M. motor. Ram stroke ½" to 7". Horizontal table travel 9⅜"; vertical 4⅞".

Multiple Spindle DRILLING MACHINES

Step up production, cut costs on small-hole drilling, tapping. Heavy duty SKF - equipped spindle is of floating-drive construction. Massive production oil table with solid floor legs. 4-spindle machine is 13" between spindles; spindle travel 4". 3- and 2-spindle models available.

Quality Shop Equipment
Since 1911

LIFE-SAVING HINTS FOR V-BELT USERS!—

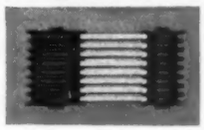


Today, one of Dayton's big jobs is to help you get longer life out of the V-Belts you use, whether they are Daytons or not. So, here are nine life-saving hints for V-Belts. They're short and to the point . . . but important—and worth remembering:

1. When installing, don't pry V-Belts over the pulley grooves—instead, slide motor forward and drop belts over the pulleys. Then move motor back until the proper tension is obtained.

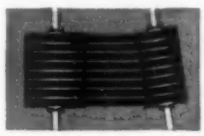
2. When the proper tension is reached, belts have "live springy vibration." When too much slack exists, belts feel dead when struck by hand.

3. Check and line up pulleys, groove for groove, and in parallel. Misalignment wears both belts and pulley grooves.



4. Check both shafts for parallel alignment so each belt can pull its share of the load.

5. Check and replace worn pulleys—they wear out belts prematurely.



6. Don't replace a *part* of a set of V-Belts with new belts as the new belts will hog the load and wear out quickly. Instead, *replace the whole set* and conserve any good belts from the old set for spares.

7. Don't let oil leak on V-Belts. Where an oily condition prevails, use the Dayton Oilproof V-Belt.

8. Don't hang V-Belts on nails, hooks or across boards or other objects which might cause them to bend sharply.

9. Belts not in use should be stored in a cool, dry place away from direct sunlight and high temperatures.

You are invited to call on your nearest Dayton Distributor for helpful suggestions or service. He will gladly help you with your V-Belt problems.

THE DAYTON RUBBER MFG. CO.
DAYTON, OHIO

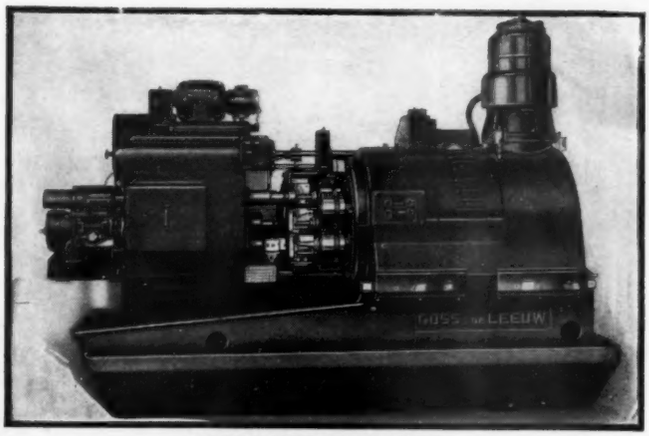
DAYTON RUBBER EXPORT CORP.
38 Pearl St., New York, N. Y., U. S. A.
The World's Largest Manufacturer of V-Belts

Dayton V Belts

LIFELINES OF POWER VITAL TO VICTORY

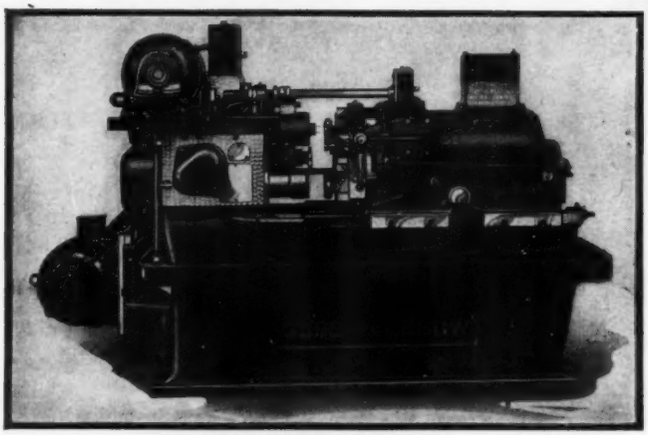
THE GREATEST NAME IN V-BELTS

GOSS & DE LEEUW *Multiple Spindle* CHUCKING MACHINES



WORK ROTATING TYPE

5 Spindles • 6 Spindles • 8 Spindles



TOOL ROTATING TYPE

4 Spindles • 5 Chucking Positions

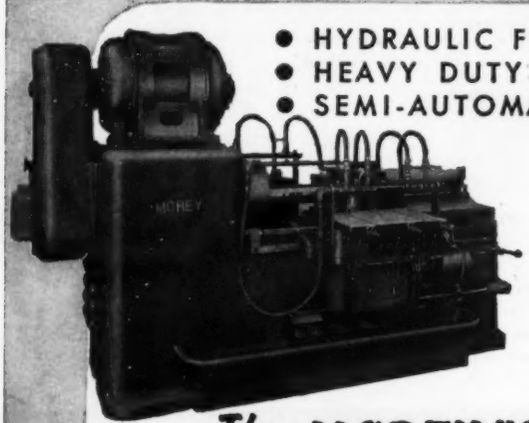
Both types of machines provide lead screw threading. Oversize spindles on these machines are mounted on pre-loaded anti-friction bearings. Ways are hardened; gears are of chrome-nickel steel, carefully heat-treated.

The many modern features offered in these machines are fully described in catalog available on request.

GOSS & DE LEEUW MACHINE CO., NEW BRITAIN, CONN.

Suitable for 105 M.M. to 155 M.M. Shells

- HYDRAULIC FEED
- HEAVY DUTY
- SEMI-AUTOMATIC



The MOREY "27" SHELL LATHE

Timken Tapered Roller Bearings for Main Spindle—All Others Anti-Friction

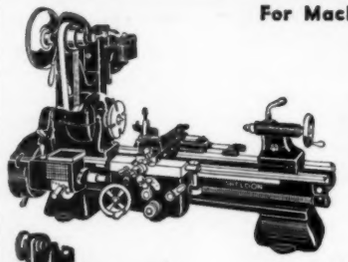
The HYDRAULIC FEED insures an almost effortless operation. Rigid enough to use carbide tools to their full capacity—entirely self-contained—no outside or auxiliary equipment required! Details in Circular 715—ask for it.

MOREY MACHINERY CO., INC

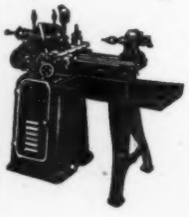
410 BROOME STREET • NEW YORK, N. Y.

SHELDON Back Geared Screw Cutting PRECISION LATHES

For Machine Shop



Both Bench and floor models with choice of Semi-quick or Full-quick Change Gears, Plain Aprons or Worm Feed Apron with Power Cross Feed, Overhead, Back or Underneath Motor Drives — Telescopic Taper Attachments, Tool Post Grinders, Milling attachments and all standard accessories.



For the Tool Room

The finest 10", 11" and 12" lathes ever built in the moderate price field. Large special analysis steel spindles GROUND ALL OVER with extra collet capacity. Hand-scraped Bronze, Ultra-Precision Ball or Super Precision Roller spindle bearings, (the finest bearings obtainable). Heavy braced, semi-steel beds with hand scraped ways (2 V-ways and 2 flat ways). These lathes come with a choice of aprons, gear boxes, and drives including the anti-friction, 4-speed, V-belt Lever-operated pedestal base motor drive illustrated. Telescopic Taper Attachment and other accessories available.

For Production

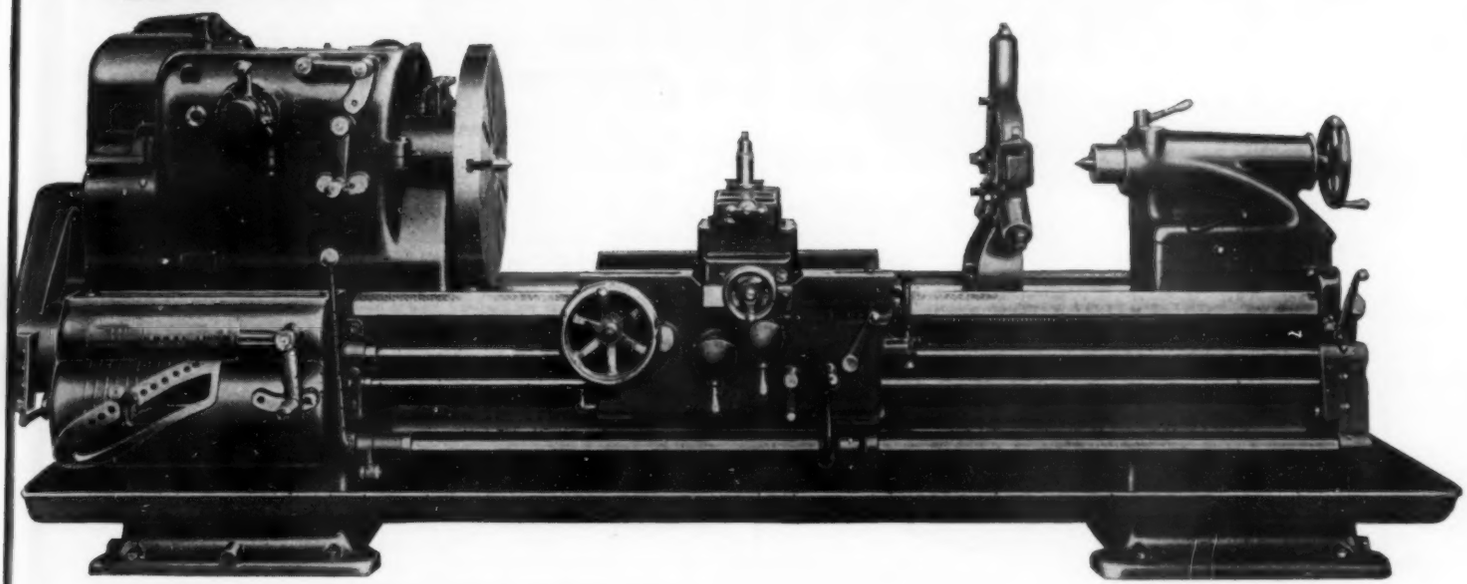
Sheldon Lathes will stand up to any production work within their capacity—are ideal for second operation work. Production models available with any or all of these features: Ultra-Precision Ball or Super-Precision motor spindle bearings, Lever-operated Collet Attachment, Lever-operated Tail Stock, Lever-operated cross slide with double tool post. Lever-operated turret, etc.

Write for Catalog and name of nearest distributor.

SHELDON MACHINE CO., INC.

4234 N. KNOX AVE. CHICAGO, U. S. A.

FOR WAR PRODUCTION



SPRINGFIELD

Geared Head Lathes

● In the Machine Tool industry's current expansion program to increase production, SPRINGFIELD Geared Head Lathes are playing a prominent role . . . in ever greater numbers, SPRINGFIELDS are being tagged "FOR WAR PRODUCTION". In turn, this demand has caused us to expand our own facilities and services to turn out more lathes, so that more guns, tanks, airplanes and other fighting tools can be economically and efficiently produced. As always, those saving features of SPRINGFIELD Geared Head Lathes—maximum gearing efficiency . . . ingenious attachments . . . rugged construction . . . superior lubricating and power transmission systems, and many more — are showing themselves to be the answer to many problems, particularly where sustained production is the order of the day. For War Production now, and normal operations later, choose SPRINGFIELD — Geared Head Lathes in sizes from 14" to 30". Write for circular #162, concerning prices, delivery dates, etc.

The SPRINGFIELD MACHINE TOOL Co.

SPRINGFIELD OHIO U.S.A.

TUNGSTEN CARBIDE TIPPED TOOLS

Price $1.00 Each In Any Size

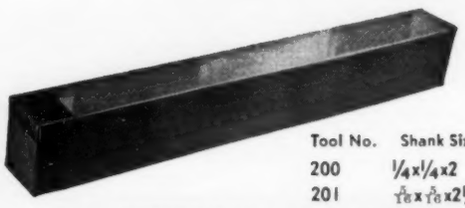
New Low Prices — Increase Production — Cut Operating Costs

Tools are tipped with Tungsten Carbide, and are suitable for machining cast-iron, brass, bronze, aluminum, non-ferrous materials such as hard rubber, bakelite, fibre, and tough alloy steels up to 500 Brinell hardness

Left Hand-Reverse Image. Right Hand Shown

SERIES 100

Tool No. RH	LH	Shank Size
R-100	L-100	1/4x1/4x2
R-101	L-102	5/16x5/16x2 1/4
R-103	L-104	3/8x3/8x2 1/2
R-105	L-106	7/16x7/16x3
R-107	L-108	1/2x1/2x3 1/2



SERIES 200

Tool No.	Shank Size
200	1/4x1/4x2
201	5/16x5/16x2 1/4
202	3/8x3/8x2 1/2
203	7/16x7/16x3
204	1/2x1/2x3 1/2

SERIES 300

Tool No.	Shank Size
300	1/4x1/4x2
301	5/16x5/16x2 1/2
302	3/8x3/8x2 1/2
303	1/2x1/2x3 1/2

Standard Tungsten Carbide Tipped Tool Bits

In lots of 12 assorted in any Series; 100-200-300 Series an extra 10% will be allowed; also in lots of 50 assorted 20% discount will be allowed.

Sizes not listed as well as special TIPPED TOOLS will be quoted upon request. When ordering, state tool number and quantity desired.

WE CARRY SILICON CARBIDE EMERY WHEELS FOR GRINDING TUNGSTEN CARBIDE TOOL BITS

Send for our new 1941 general catalogue

VICTOR MACHINERY EXCHANGE, Inc.
251 CENTER STREET NEW YORK, N. Y.

CLEANING CONTROLS OUTPUT

FAST Oakite Cleaning Keeps Production UP . . . Rejects DOWN!

In your production line, there are one or more degreasing or cleaning operations that importantly control the amount and quality of the vital war products you are turning out. It is why FAST, dependable Oakite alkaline cleaning can help you keep your production on a FAST, trouble-free basis . . . can help you minimize rejects and keep costs down. Tell us your problems . . . we can help!

OAKITE PRODUCTS, INC., 24 Thames Street, NEW YORK, N. Y.
Representatives in All Principal Cities of the U. S. and Canada

OAKITE *Specialized* **CLEANING**
MATERIALS & METHODS FOR EVERY CLEANING REQUIREMENT

UNIVERSAL CENTERING CHUCKS AND STANDARD CHUCKS STEP UP ACCURACY—INCREASE SPEED

Above: Universal Centering Chucks convert a drill press into a centering machine. Furnished with a set of bushings and collets for various size center drilling. Accurate and sturdy. Depth adjustment for centers. Write for facts.

Above: Universal Standard Collet Chucks hold tools in a grip as strong as solid steel itself. Nut for spanner wrench. The ideal tool for holding end mills, keyway cutters, drills, etc. Write for facts.

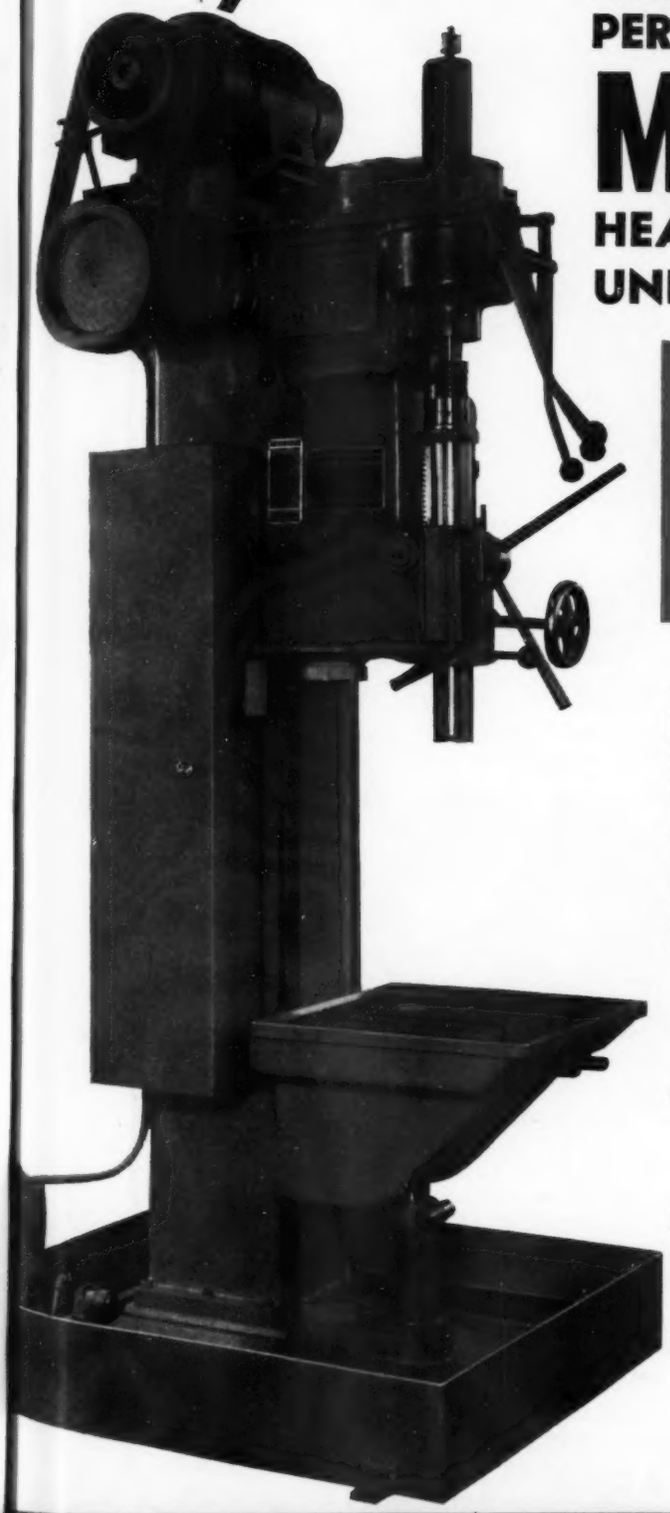
UNIVERSAL ENGINEERING CO.
FRANKENMUTH · MICHIGAN

BAKER

. . . OFFERS YOU
HIGH CAPACITY DRILLING
PERFORMANCE with the NEW

MODEL No. 150

HEAVY DUTY DRILLING MACHINE
UNIVERSAL QUICK CHANGE TYPE



. . . SPEEDY
. . . VERSATILE
. . . EFFICIENT

● A new BAKER-built unit—the Model No. 150 Heavy Duty Drilling Machine—has been specifically designed to supplant the proved and satisfactory Model No. 121. It has wider speed and feed ranges, so as to meet today's expanded demands with a greater degree of economy and efficiency.

With conditions such as they are . . . more and better production being the order of the day . . . let's consider the Model No. 150's highly effective speed range. Twelve instantaneous quick changes, from 48 to 1120 R.P.M., are available. In addition, each machine is furnished standard with one set of pick-off gears, which doubles range of available speeds to twenty four up to 1120 R.P.M. Needless to say, such speedy versatility, combined with the other characteristics found in this machine, stamp it as the unit you need to meet expanded production schedules. Get in touch with us—write, wire or phone—we'll be glad to give you complete information—send you descriptive folders--engineering data sheets.

The MODEL NO. 150

CAPACITY . . ample to drive 1½" diameter High Speed Twist Drills, to the limit of their efficiency in steel. Can be adapted to boring, counterboring, facing, forming and tapping operations.

DESIGN and CONSTRUCTION . . . incorporates vertical column assembly of 2-piece design. Spindle is of forged high carbon steel—has No. 4 Morse Taper. Spindle end has cross slot for holding tool securely.

DRIVE . . . furnished motor driven only. Power transmitted through multi-vee belts. Machine is standard furnished with reversing Controller allowing for Tapping. Manual Control with Push Buttons. Machine also furnished Single Purpose type.

BAKER BROTHERS INC. Toledo, Ohio, U.S.A.

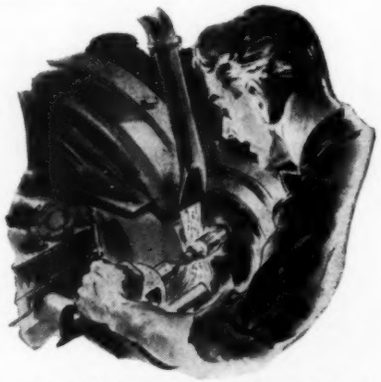
OUR MOTTO SINCE 1867
"MACHINES: STURDY and EFFICIENT,
AS FINE AS CAN BE BUILT . . ."

DRILLING • BORING • TAPPING
AND
KEYSEATING MACHINES

Now they fly ten times as long without overhauling!

The flimsy crates of World War 1 needed overhauling after as little as 24 flying hours. But today's planes fly hundreds of hours at much higher speeds before a major overhaul. The reason? New materials, new designs and new methods of finishing metal surfaces. Finishes so nearly perfect that bearings, cylinders, pistons and cams are made practically wear-proof! It's a process in which Carborundum has played an important part...by supplying the finishing wheels and stones required.

Formerly ultra-finishing was a long tedious task. But thanks to the new process, finishes accurate to a few millionths of an inch can now be produced on ground surfaces on a production basis. Application of these finishes to wartime engine production has improved the fighting efficiency not only of planes, but of tanks and other motorized equipment. Fewer men are needed for maintenance and repair.



Ultra-finishing with extremely fine grit wheels—as fine as 600 grit—is only one of many ways in which Carborundum may be able to help you save precious time. If you have a production problem that abrasives might solve, write The Carborundum Company, Niagara Falls, New York.

CARBORUNDUM
REG. U.S. PAT. OFF.
ABRASIVE PRODUCTS

Carborundum is a registered trade-mark of and indicates manufacture by The Carborundum Company.

SUNNEN Solves Another Problem

The Job

Collet — .305" hole, hardened. Stock removed .002". Tolerance — Minus .000" plus .001". Finish — 2 to 3 micro-inches — practically all parts tested on Brush Surface Analyzer for micro finish and inspected under Comparator. Previous method used — hand lapping.

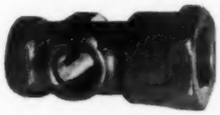
Time saved by Sunnen Honing — 35%.

"Since installing our first Sunnen Honing Machine we have constantly added more and more parts to pass through the honing process. We now have six machines in use."

— Fidelity Machine Company

SUNNEN HONING provides a finish of 2 to 3 micro-inches — and at a saving of 35% in time!

Airplane Engine Parts accurately honed to a super-smooth finish.



Bronze Valve. The Sunnen method of honing is used to secure a high finish and accuracy.

Aviation Hydraulic Cylinder made of Aluminum-Alloy. Improves the quality of the bearing surface. An extremely smooth surface-finish is secured.

Aircraft Valve Tappet Roller. 4-Micro finish.

"Produced on extremely accurate and glass-like finish."

Diesel Engine Fuel Injector Cylinder "So accurate that a piston can be fit within .00005 inch."

Accuracy — and a super-smooth finish with a real increase in production which means a saving in cost. That's the record of the Sunnen "MA" Precision Honing Machine in the modern plant of the Fidelity Machine Company.

This one example is indicative of the many reasons why hundreds of leading manufacturers handling important war contracts have adopted Sunnen Honing.

Consider These Advantages

Wide range — handles internal diameters of .185" to 2.400". Accuracy within "one-tenth" guaranteed — has been held to .000025" on production jobs. Relieves big internal grinders for other jobs. Corrects errors of out-of-roundness or taper caused by previous operations. Facilitates duplication of sizes. Does not require skilled labor. Practical — inexpensive — economical to operate.

Put Sunnen Honing to work in *your* plant!

SUNNEN PRODUCTS CO., 7941 Manchester Ave., St. Louis, Mo.

Canadian Factory, Chatham, Ontario

Send for FREE BULLETIN

— Giving complete information. Or, if you prefer, a Sales Engineer will call and demonstrate this equipment in your plant, on your job.

SUNNEN

Three Easy Steps to Faster, Better Sanding with a Metalite "Pencil"

Only one of dozens of time-saving Coated Abrasive "Gadgets" ready for your use.

1 Simply wind a strip from a Metalite Cloth Handy Roll on a split spindle.

2 Make one end fast with a narrow piece of adhesive tape.

3 Lock the portable tool in a vise (or use it free hand) to remove burrs from any odd shaped parts.

(Fresh abrasive instantly available by merely tearing off the small used section.)

BEHR-MANNING
(DIVISION OF NORTON COMPANY)
TROY, N. Y.

DEPENDABLE ABRASIVES SINCE 1872

Tapping machine operators in key war industries everywhere are "discovering" in THREADWELL Taps the way to new records in threading performance. To them, this new name THREADWELL means ***results*** -- more holes per tap, and superlative quality. Have you tried THREADWELL?

WRITE FOR CATALOG ON YOUR FIRM LETTERHEAD.

THREADWELL TAP AND DIE CO.

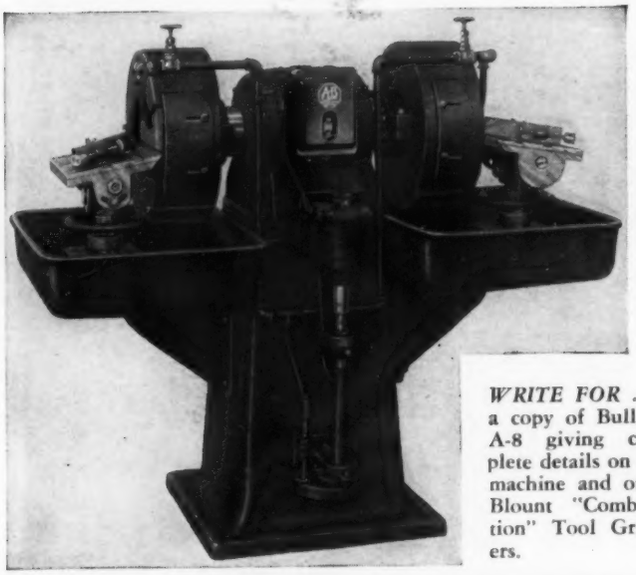
GREENFIELD, MASS.

SALES AGENTS: *Canada* - BRIDGE MACHINERY COMPANY, *Montreal*. *England* - SKYLUX, LTD., *London*.

MODEL TC WET GRINDER

"Blount"

FOR COOLER, CLEANER, FASTER AND MORE ACCURATE TOOL GRINDING



WRITE FOR . . . a copy of Bulletin A-8 giving complete details on this machine and other Blount "Combination" Tool Grinders.

Today's demands for faster, precision production can be met by the proper conditioning of tools assured by this "BLOUNT" Tool Grinder.

Equipped with adjustable graduated tables, the Model TC will grind all possible angles and clearances on tools.

Features include fully enclosed ball bearing motor; collant tank of ample capacity and easily removable sludge pan in column; vertical motor-driven centrifugal coolant pump; heavy, quickly adjustable guards.

Condensed Specifications

Base of column: 23" x 24"

Base to center of spindle: 37½"

Pan: 6" deep x 27½" wide

Table top: 9½" x 11½"

Adjustable table tops: hardened and ground and equipped with protector guide.

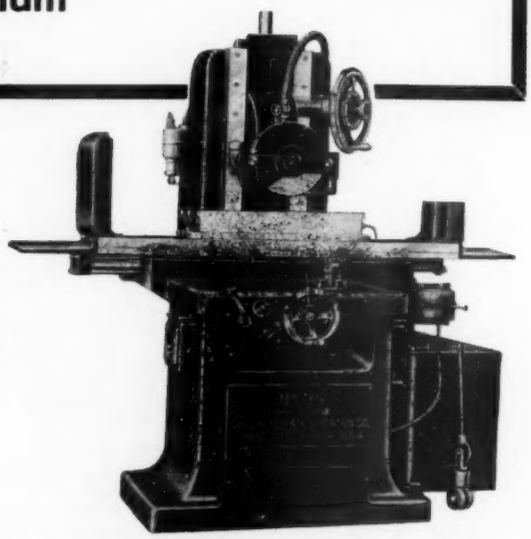
Motor: 3 HP.; 1200 RPM; all voltages

Wheels: cup 14" x 4" x 11"

J. G. BLOUNT COMPANY *Everett, Mass., U.S.A.*

GRAND RAPIDS HYDRAULIC FEED SURFACE GRINDERS

. . . . for high accuracy under maximum production requirements



The No. 35 "Grand Rapids" has a table working surface of 8" x 24"; maximum longitudinal table speed is 115 ft. per minute; automatic longitudinal table travel is 26"; transverse, 9¼"; vertical movement of wheel head 12"; standard spindle speeds 2000 and 2800 R.P.M.

● Developed especially for the maximum in speed, accuracy and smoothness, the Grand Rapids No. 35 High Speed Precision Tool Room Type Hydraulic Feed Surface Grinder offers production and convenience features which have been proved right in service.

Both longitudinal table travel and cross feed are hydraulically actuated, making possible wide flexibility. Proper grinding of almost any material can be handled at maximum table speed.

Features include the massive sturdy "Grand Rapids" one-piece column and base, a construction which assures permanent alignment of cross travel and upright head ways.

Bulletin GL 100 contains complete details. Write for your copy.

GALLMEYER & LIVINGSTON CO.

330 STRAIGHT AVE., S.W. GRAND RAPIDS, MICHIGAN

YOU CAN FORGET
Your Honing Problem!

Yes, sir! We know that's quite a claim. But we mean it. You CAN forget your honing problem. And, furthermore, we're eager to prove that you can.

No matter what your problem may be MID-WEST produces a honing stone that will solve it—and any MID-WEST engineer will be glad to help you select that particular stone.

Quite naturally you ask: "How can you guarantee to eliminate my problem?"

The answer, of course, is MICRO BOND, the remarkable new abrasive developed by Mid-West engineers that has completely eliminated guesswork from abrasive stone manufacturing. MID-WEST MICRO BOND honing and superfinishing stones are precision-made. Their hardness, grain structure and dimensional specifications are CONTROLLED to the precise degree required for any given job. That means uniformity between one shipment and another. And they are made to fit any standard lapping, honing or superfinishing machine. That means YOU can use them in your present machines.

Micro Bond envelopes each tiny grain—permits no "bunching," therefore eliminates scratching. Micro Bond stones also cut faster, wear down more uniformly and retain their operating efficiency about 20 per cent longer than average stones. And, lastly, Mid-West Micro Bond stones are "cool cutters"—generating up to 90 per cent less heat than do ordinary abrasives.

There's your answer, Mr. Production Man! That's why you can forget your honing problem. Why not let us increase your production by eliminating your honing slow-downs. We have capable engineers in most large cities of the United States. They are yours to command. Call them in and ask about MICRO BOND. Or, just fill out the coupon printed herewith. Mail it in—and you will hear from one of our representatives promptly. Samples are shipped from stock immediately.

MID-WEST ABRASIVE COMPANY

Manufacturers of DEPENDABLE Honing Stones

1960 E. MILWAUKEE AVENUE — DETROIT, MICHIGAN

Mid-West

FOR VICTORY BUY UNITED STATES WAR BONDS AND STAMPS

★ *Honing Stones*
★ *Superfinishing Stones*
★ *Grinding Wheels*
★ *Emery Cloth*
★ *Sandpaper*

Mid-West Abrasive Company,
1960 E. Milwaukee Avenue,
Detroit, Michigan

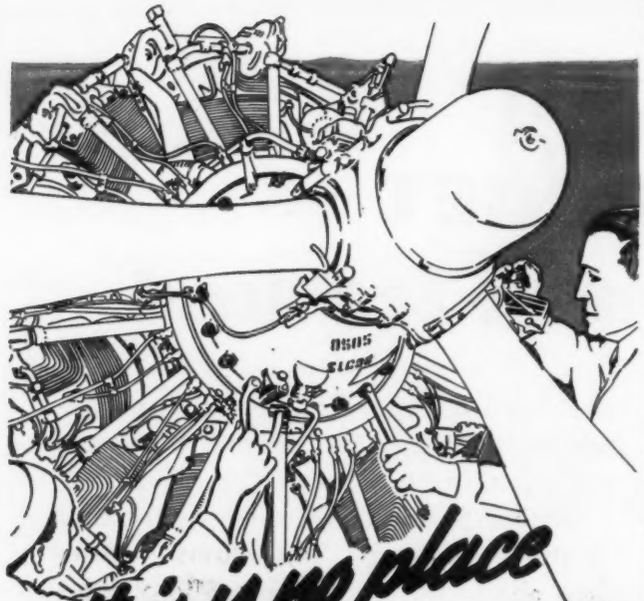
Gentlemen: Please send me additional information on Mid-West Micro Bond honing and superfinishing stones.

Name _____

Company _____

Address _____

City _____ *State* _____



This is no place for a LOOSE NUT

. . . and that goes too for thousands of other vital positions on America's fighting airplanes where careful designers have placed Elastic Stop Nuts. These self-locking self-gripping fastenings have proved, through fifteen years of reliable service on aircraft, that they remain tight under all combinations of vibration, stress, shock, exposure to weather, and prolonged heavy duty. They are used today on *every* military and transport airplane built in the Western Hemisphere.

There are more Elastic Stop Nuts on American airplanes, tanks, and other war equipment, than all other lock nuts combined.

●

ELASTIC STOP NUTS may be the solution to *your* fastening problems. Sample nuts, for testing, will be furnished without cost or obligation.

» Write for interesting folder explaining the Elastic Stop self-locking principle.

ELASTIC STOP NUT CORPORATION
2351 VAUXHALL ROAD • UNION, NEW JERSEY

WITH THE RED LOCKING COLLAR . . . SYMBOL OF SECURITY

LONG-LIVED
Brown & Sharpe Pumps

Geared, Vane and Centrifugal

Give *more* and *better* service in today's accelerated production.

Ask for Catalog on the whole line -- including Motor Driven Pumps

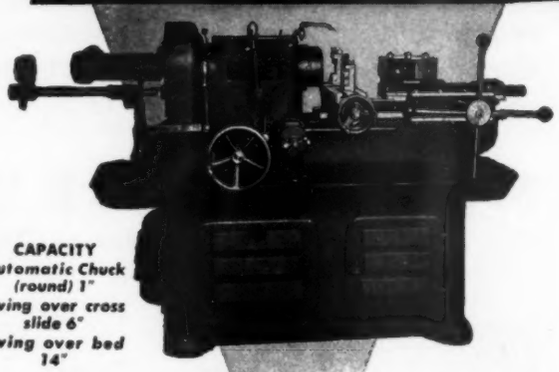
BROWN & SHARPE MFG. CO.
Providence, R. I., U. S. A.

B·S

BROWN & SHARPE PUMPS

for ECONOMY — for HIGH SPEED PRODUCTION

The MOREY 2G
Back-Geared
TURRET LATHE
Timken Bearing
Self-Locking Turret and Infinite Spindle Speeds



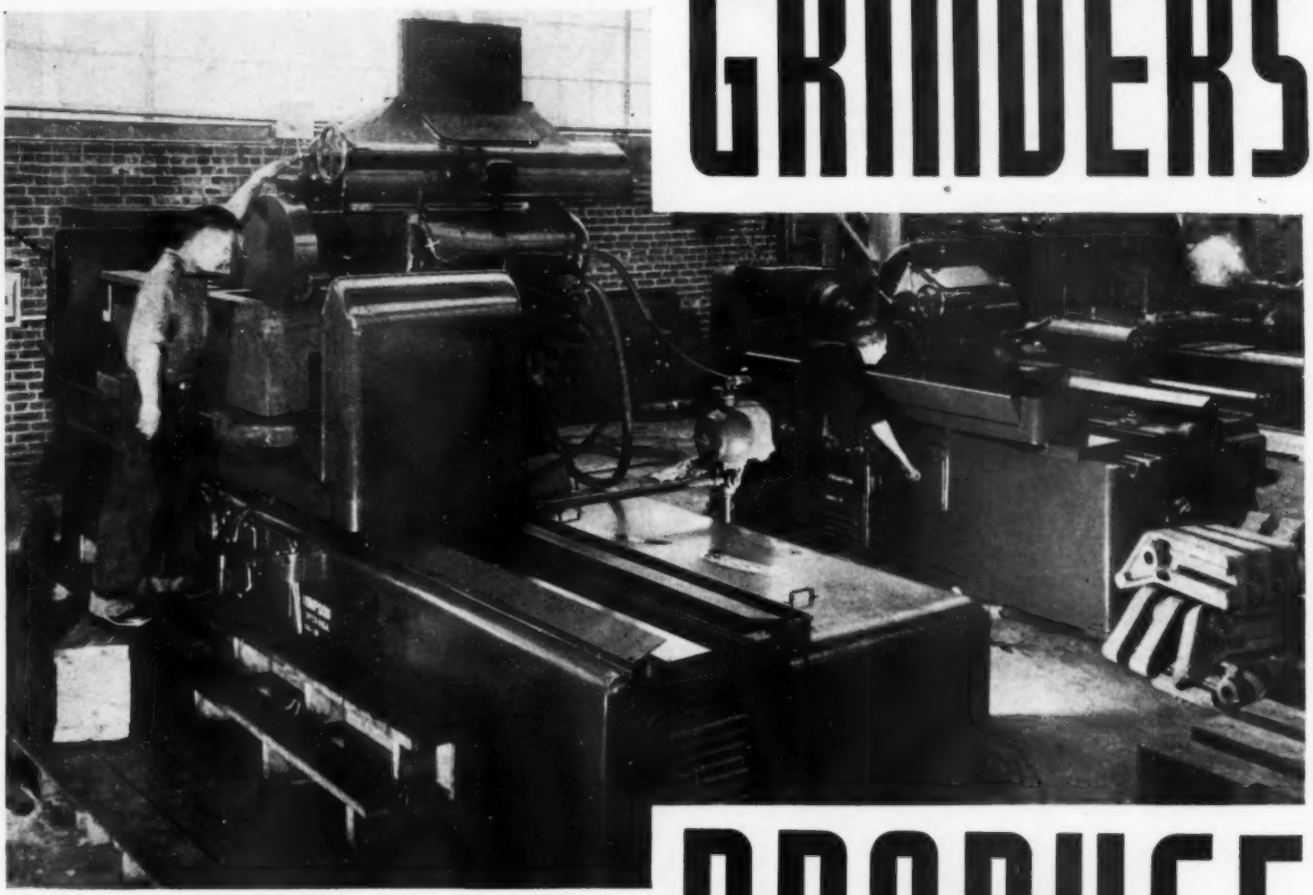
CAPACITY
Automatic Chuck (round) 1"
Swing over cross slide 6"
Swing over bed 14"

Thousands of the MOREY 2G Turret Lathes are saving money with no sacrifice of high speed production. Economy features: Back Gears are instantly thrown in through extra large Twin Disc Clutch—Full advantage from high speed and carbide tools —Vibrationless precision and an infinite variety of spindle speeds for every job—Timken bearing—Self-locking turret. Can be furnished with tooling.

Ask for Circular 629 for full details

MOREY MACHINERY CO., INC
410 BROOME STREET • NEW YORK, N. Y.

THOMPSON GRINDERS



PRODUCE

MORE PARTS of Superior Finish FOR MORE MACHINES of WAR

More and more production is vital to our "all out" War program—but that production must be to closer tolerances than ever before.

Thompson Grinders are helping hundreds of manufacturers keep in step with production needs and still meet exceptional demands for accuracy.

Illustrated is a C type Thompson Grinder finishing a Meehanite bed casting 24" high x 24" wide and maintaining tolerances for straightening.

The Thompson full hydraulic operation insures a smoothness that is reflected in the finish and accuracy of the work—and provides for the continuance of this dependable accuracy and smooth finish over long periods.

Get acquainted with the many advantages of Thompson Grinders — bulletins give complete details. Write for yours.

THE Thompson GRINDER COMPANY

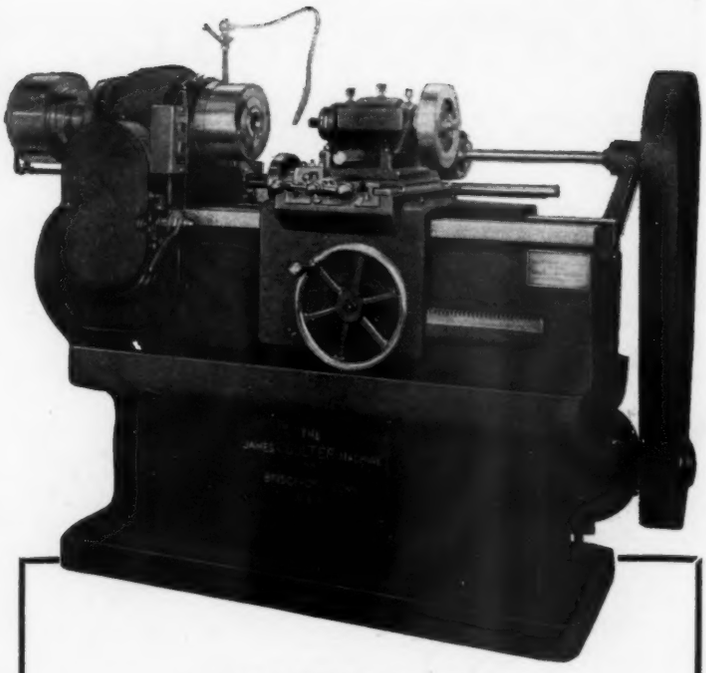
Springfield, Ohio

Keep Ahead of
DEFENSE DEMANDS
on the PRODUCTION of
EXTERNAL and INTERNAL THREADS

The Coulter Type "H" Hob Thread Miller—modern in every detail of design and construction—handles high speed, accurate production of right or left hand threads. Any parts that can be held in ordinary chucks, air operated chucks, air operated collet chuck or special face plate fixture can be threaded on this machine.

Work holding spindle and cutter spindle are driven by individual motors through worm and gears. Speed changes to work spindle are accomplished by pick-off gears; cutter spindle speeds are controlled by variable motor sheave. All high speed shafts turn in anti-friction bearings.

Maximum external thread, 7"; minimum hole depends on smallest hob practical.

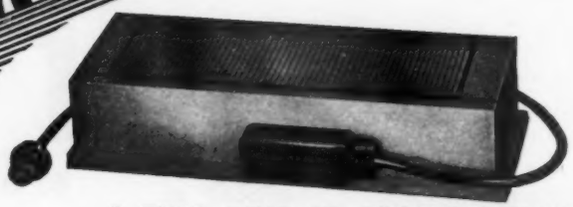


Send for Descriptive Bulletin giving full information.

The James COULTER *Machine Co.*
BRIDGEPORT • CONNECTICUT • U.S.A.

WALKER MAGNETIC CHUCKS

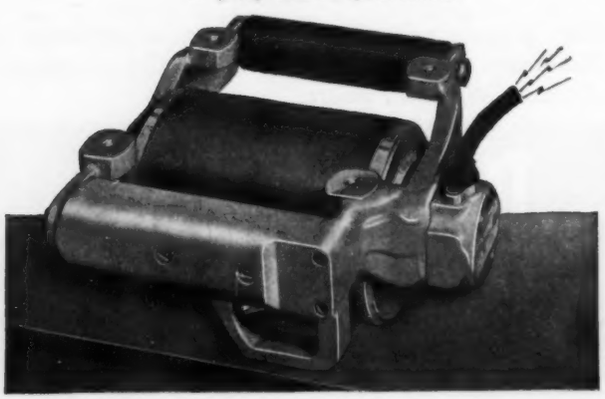
Style B Face Plate — in standard diameters from 10⅜" to 36½" inclusive.



No. 617 Bar Pole Face Rectangular Magnetic Chuck.

DEMAGNETIZERS

Walker DEMAGNETIZERS are available in standard D.C. and A.C. types for either 110 or 220 v. Ask for Bulletin K7 giving detailed specifications.



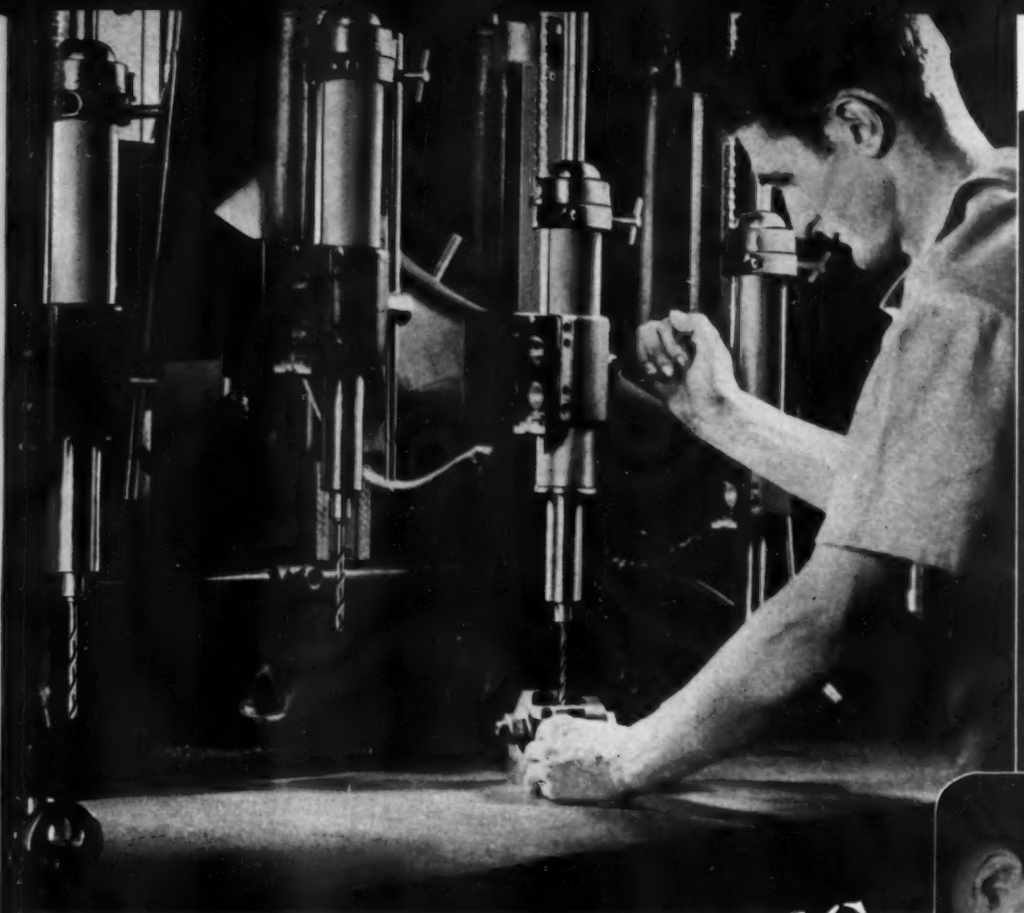
A FULL LINE OF PROVED STANDARD DESIGNS

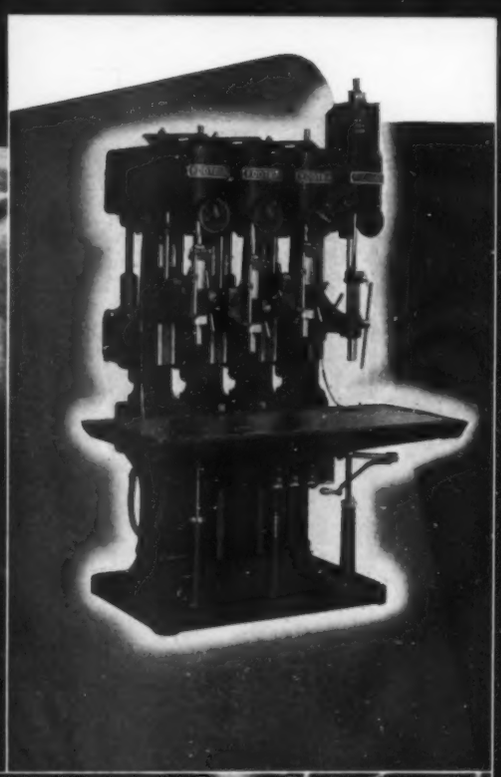
Walker offers prompt and complete service on magnetic chucks by carrying in stock a considerable line of Rectangular and Rotary types for use on all surface and internal grinding machines built by American machine tool manufacturers. These units—for grinding, milling, planing and turning operations—are of proved design and are available in such a complete range of sizes as to enable you to select standard units for practically any chucking problem. Write for bulletin W4 giving detailed information.

Also special CHUCKS *for special* NEEDS

The design of Walker Magnetic Chucks is such that "specials" can be developed and furnished at prices only slightly more than standard units. If you require special magnetic chucks for special purposes, consult Walker and be assured of prompt, economical service.

O. S. WALKER CO., INC.
WORCESTER, MASS.





FASTER DRILLING IN TOOL ROOM OR ON PRODUCTION LINE

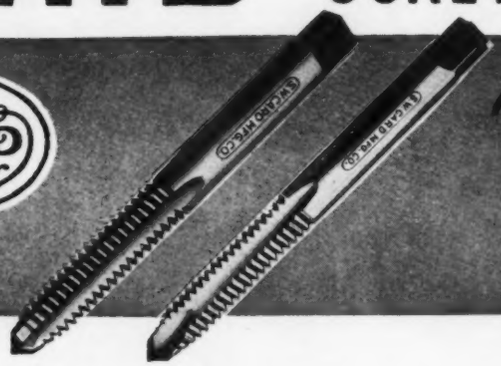
• Footburt sensitives combine the wide range of speeds needed for production drilling or tool room work with the power and rigidity to drive tools to their full cutting capacity.

Speeds with back gear unit are available from 185 to 3500 R.P.M. on Number 2 machines, and from 118 to 820 R.P.M. on Number 3 machines. Automatic power feed and tapping attachments provide the means for highest production war work. Write or wire for price and delivery information.

THE FOOTE-BURT COMPANY
CLEVELAND, OHIO
Detroit Office: 4-253 General Motors Building

FOOTBURT *Sensitive* DRILLING MACHINES

CARD MACHINE SCREW TAPS



The CARD Quality

Buy them and put them to work

Carbon and High Speed Steel

Manufactured in Regular Type in 2, 3 or 4 flutes according to size and in Spiral Pointed Type in 2 flutes.

Both Regular and Spiral Pointed Types are furnished with National form of thread. Regular Type furnished in taper, plug or bottoming styles. Spiral Pointed furnished in plug style only. Furnished in Carbon, High Speed cut and High Speed Ground Thread.

Put Card Machine Screw Taps to work and their performance will convince you of their economy. You'll find sizes listed in the Card Catalog No. 34, pages 32-37. Circular covering recommended uses available on request.

Leading dealers carry the Card line

S. W. CARD MANUFACTURING CO.
Mansfield, Mass., U. S. A.
DIVISION OF UNION TWIST DRILL CO

STORES: New York: 61 Reade St., Chicago: 11 S. Clinton St.
Detroit: 6540 Antoine St., San Francisco: 121 Second St.
Seattle: 568 First Avenue, South
Los Angeles: 524 East Fourth Street

Bring On THOSE EMERGENCY DEMANDS

"Buffalo" Production Drills turn out the work faster because they're "geared" to the operator. Yes, they fit the man at the controls, because all Buffalo Drill Controls are at his finger tips. That makes *him* more efficient on today's war production assignments. Built down to the smallest details for fast, dependable output, Buffalo Production Drills are ably qualified to fulfill any emergency demand on a 24-hour-a-day schedule!

BUFFALO FORGE COMPANY

"Buffalo" **DRILLING MACHINES**

448 Broadway, Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd.
Kitchener, Ont.

"Train your Sights" ON Avey DRILLING MACHINES

. . . these standard type Aveys are famous for their Versatility — maintaining high production levels. In the "sights" is our type MA-6. It is built in No. 2 and No. 3 sizes one to six spindle units, any size—six speed machine two speed motor with three mechanical changes through gearing-speed range, eight to one-push button control as shown. The machine illustrated has three spindles—the Aveymatic Feed, the Hand Feed and the Tapper.

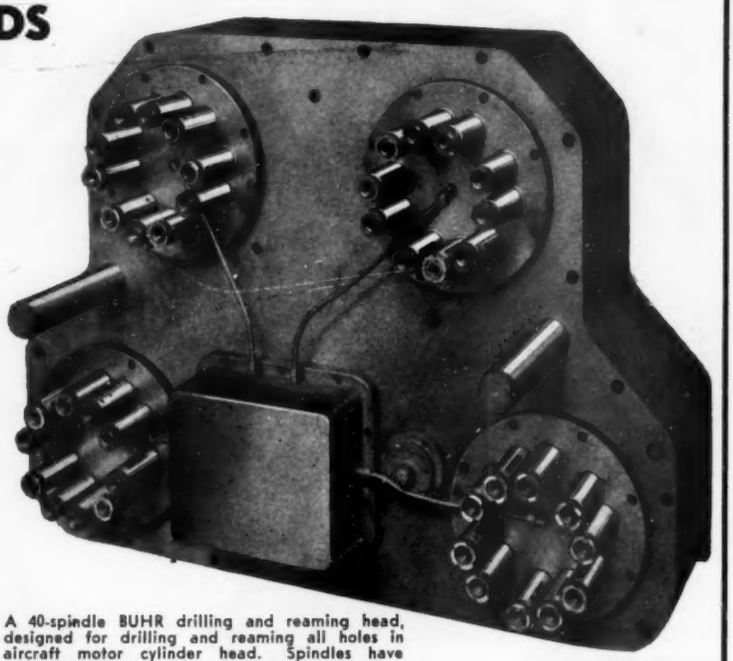
THE AVEY DRILLING MACHINE CO.
CINCINNATI, OHIO, U.S.A.

Avey DRILLING MACHINES
CINCINNATI · OHIO

Buhr DRILL HEADS SIMILAR TO THIS ONE,

ARE SPEEDING PRODUCTION IN VITAL WAR PLANTS

Here is but one example of the specialized engineering incorporated in BUHR - designed drill heads, now being used in the production of aircraft and armament. Want similar applications, so as to speed your work? Then send us your blueprints . . . . we'll make suggestions and recommendations on the use of BUHR-engineering and equipment.



A 40-spindle BUHR drilling and reaming head, designed for drilling and reaming all holes in aircraft motor cylinder head. Spindles have provision for vertical adjustment to lengthen drills. Oil pump gives positive lubrication at all times.

BUHR MACHINE TOOL COMPANY • ANN ARBOR, MICH.
Specialists in Multiple Spindle Drilling, Boring, Reaming, Tapping Equipment

HEAT-FAG and ACCIDENTS Ride Together

Beware of HEAT-FAG!

IT STRIKES at workers when sweating reduces the normal salt balance in their bodies. It increases fatigue — paves the way for carelessness — costly mistakes, accidents.

MORTON'S *Salt Tablets*

Install Morton's Dispensers by all drinking fountains, so workers can take tablets to replace the salt lost by sweating.

ORDER NOW!

Salt Tablets Case of 9000 **$2.60**

Salt-Dextrose Tablets Case of 9000 **$3.15**

Dispensers

500-tablet size **$3.25**

1000-tablet size **$4.00**

MORTON SALT CO., Chicago, Ill.

SECOMET Resinoid Bonded Diamond Wheels can do your work more accurately, faster and without appreciable wear. They are most economical for sharpening cemented carbide and multi-bladed tools, such as milling cutters, broaches, etc. Moreover, their sharp, free-cutting action eliminates lapping and the usual semi-finish grinding operation. Catalog on request.

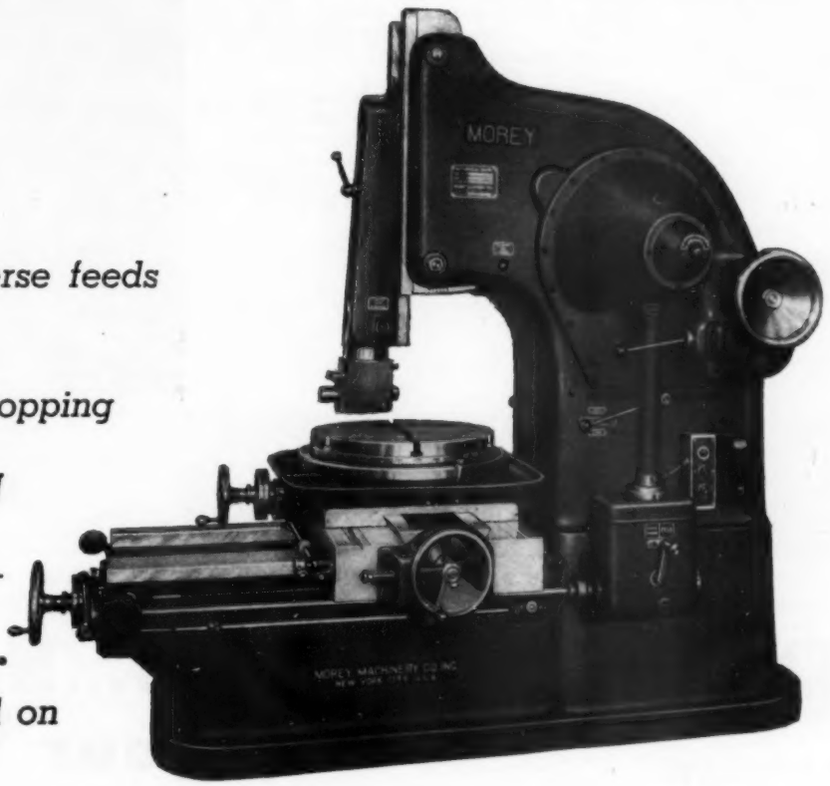
Prompt deliveries

J. K. SMIT & SONS, INC.
157 Chambers Street, New York

EARLY DELIVERY

MOREY 8" VERTICAL SHAPER

EQUALLY EFFICIENT IN YOUR TOOL ROOM OR MANUFACTURING DEPARTMENT



FEATURES:

PRECISION

POWER *rapid traverse feeds in all directions*

BRAKES *for quick stopping*

BIJUR LUBRICATION

TIMKEN BEARINGS— *Bull gear mounted on Timken bearings • Roller table mounted on Timken bearings*

CUTTING STROKE *and* ***FEED*** *instantly available by single levers • Stroke immediately adjustable, automatically locked*

MODERN DESIGN—*easy to operate—built to highest standards • Finest materials*

POWERFUL—*yet finger-tip control throughout*

WE ALSO BUILD THIS SHAPER IN 12" AND 14" SIZES

ASK FOR CIRCULAR No. 726

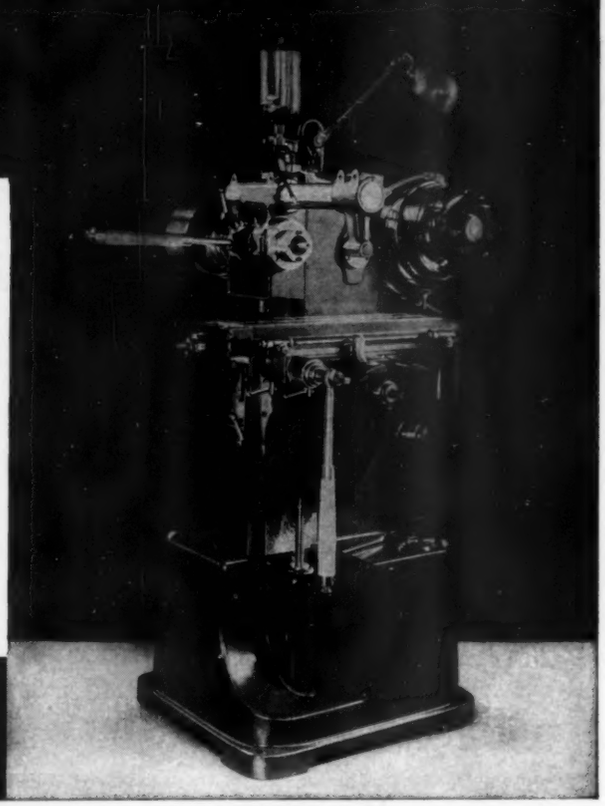
DESIGNED AND BUILT BY

MOREY MACHINERY CO., INC

410 BROOME STREET • NEW YORK, N. Y.

THE NICHOLS HAND MILLING MACHINE

handles a wide variety of parts at high speed and low cost . . . .



This sturdy, versatile, precision machine—the latest development in this type of hand miller—incorporates features which increase its utility and ability to handle a wide variety of operations at high speed and low cost as compared with larger, slower machines.

Because of its ease of set-up, high cutting speeds and maintained precision, together with elimination of unnecessary friction, it is ideally suited to tool room production requirements. In proportion to its price, the "NICHOLS" is considered one of the most productive machine tools in the field. Its wide use in modern shops is outstanding evidence of its indispensability for today's requirements.

CONDENSED SPECIFICATIONS

Longitudinal Feed—10"
Traverse Feed—7"
Vertical Feed of Knee—13½"
Vertical Movement of Head—4½"
Spindle speeds—100, 200, 600 and 1200 R.P.M.

Write for illustrated Bulletin, giving complete information

W. H. NICHOLS & SONS

WALTHAM, MASS., U.S.A.

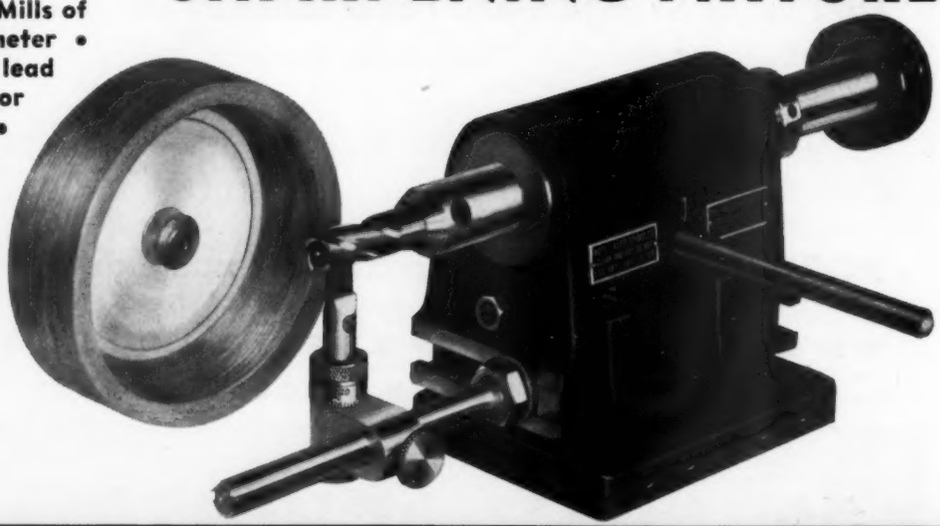
END MILLS ARE SCARCE...MAKE 'EM LAST

Use your WELDON SHARPENING FIXTURE

COMPLETE!
SELF-CONTAINED!

Quickly re-sharpens End Mills of 3/16" to 1¼" shank diameter • Requires no centers or lead cams • Releases major production equipment • Designed for any grinder with flat table • No table movement necessary • Operated by trained or unskilled workers • Provides tool conservation — a vital war factor.

SIMPLE!
CONVENIENT!
FLEXIBLE!



THE WELDON TOOL CO.

3002 WOODHILL ROAD • CLEVELAND, OHIO

"Yesterday's Pioneer — Today's Leader"

END MILLS • GROUND CIRCULAR AND FLAT FORM TOOLS • SCREW MACHINE CAMS • "TU-LIP" COUNTERBORES

This is your Industrial Supply Distributor's pledge to help you keep your contracts moving with never the loss of a minute's production if it can be avoided. It means he will put forth every resource to keep you furnished with the vital supplies and equipment you must have to keep up your share of the War Effort.

It will make your work easier, simpler, less costly, to buy through your own nearby Mill Supply House, because:—

1—Mill Supply Houses do their buying from literally hundreds of Manufacturers and are trained to keep hunting for what you need until they find it.

2—Their facilities are organized to handle all the complicated details of contacting, buying and expediting deliveries from scores of these suppliers, *every day.*

3—They buy outright large stocks of supplies they know you will need—sometimes 25,000 or more separate items—then stock them for quick delivery to you.

4—They know Priorities and can help you obtain essential materials in cases where you do not have blanket authorization.

5—If they cannot complete your order in one delivery they usually can rush out an emergency supply saying "here's enough to keep you going—more soon."

This incident is typical of the unusual services that many Mill Supply Distributors are rendering their customers during the Emergency.

Take your own Mill Supply Distributors into your buying confidence—let them serve you as a vital source of supply not only now, but permanently.

Our own great faith in them is based upon the many years' experience in which they have represented us as Distributors of Cle-Forge High-Speed Drills and Peerless High-Speed Reamers nationwide.

The CLEVELAND TWIST DRILL COMPANY
1242 EAST 49th STREET
CLEVELAND

TRADE MARK REG. U. S. PAT. OFF. AND FOREIGN COUNTRIES

30 READE ST. NEW YORK · 9 NORTH JEFFERSON ST. CHICAGO · 650 HOWARD ST. SAN FRANCISCO
6515 SECOND BLVD. DETROIT · LONDON - E. P. BARRUS, LTD. - 35-36-37 UPPER THAMES ST. E.C.4

"CLEVELAND" DISTRIBUTORS EVERYWHERE ARE READY TO SERVE YOU

"DIFFICULT" JOBS WANTED!

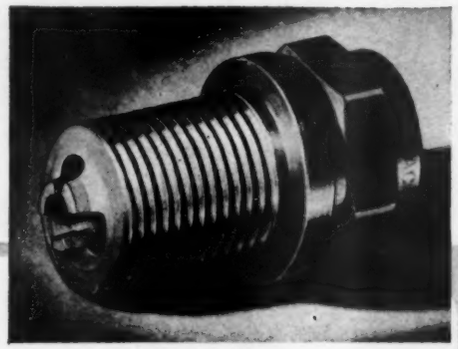
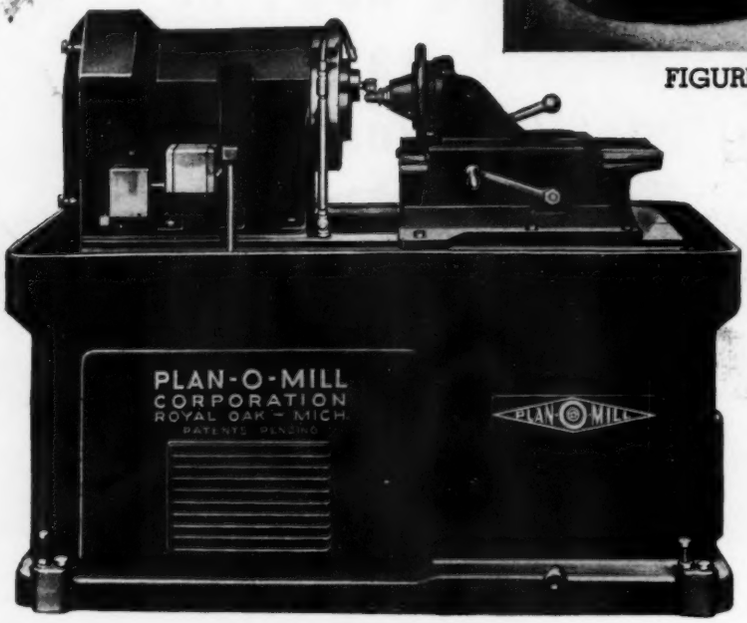


FIGURE 1



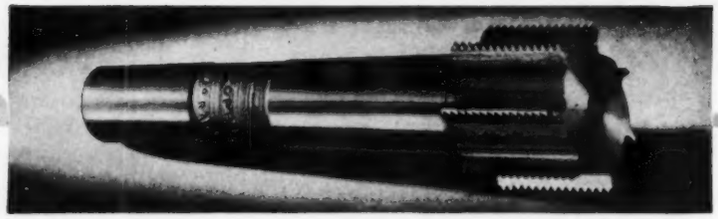


FIGURE 2

● Have you a "difficult" job of threading or cylindrical forming—one where *both* high speed and high precision are required?

Are you interested in saving time—saving material—saving cutters?

Then Plan-O-Mill is your machine!

• • •

In one nationally famous arms plant, spark plugs (Fig. 1) are being threaded by Plan-O-Mill with a cycle time of 35 seconds per piece. Unusual accuracy is obtained. The part does not revolve—all motion is confined to the milling cutter, which revolves around the work.

Cutter life is good. Worked at a 55 parts per hour rate, cutters on this job produce an average of 400 pieces per grind with about 25 grinds per cutter. The one shown here (Fig. 2) has milled more than 10,000 pieces.

Plan-O-Mill's fast, accurate production makes it the ideal machine for your "difficult" problem.

Write Dept. A for catalog.

PLAN-O-MILL
CORPORATION
(FORMERLY THE GORDON-R CO.)

PLAN-O-MILL

WASHINGTON SQUARE BLDG.
ROYAL OAK, MICHIGAN

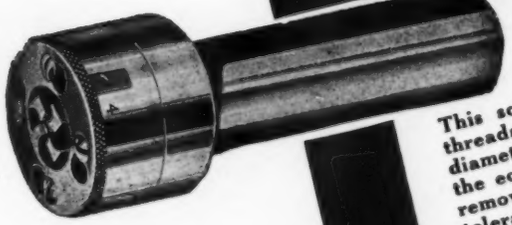
What Do You Cut?

COARSE THREADS?

Equipped with a roughing and finishing attachment* and extra heavy, rigidly mounted chasers, the Style "D" Geometric Self-Opening Die Head cuts large diameter, coarse pitch threads with speed and accuracy. Threads from ⅛" to 3½" in diameter . . . any length within the limits of the machine . . . right up to a shoulder if necessary, can be cut with rugged and versatile line of tools.

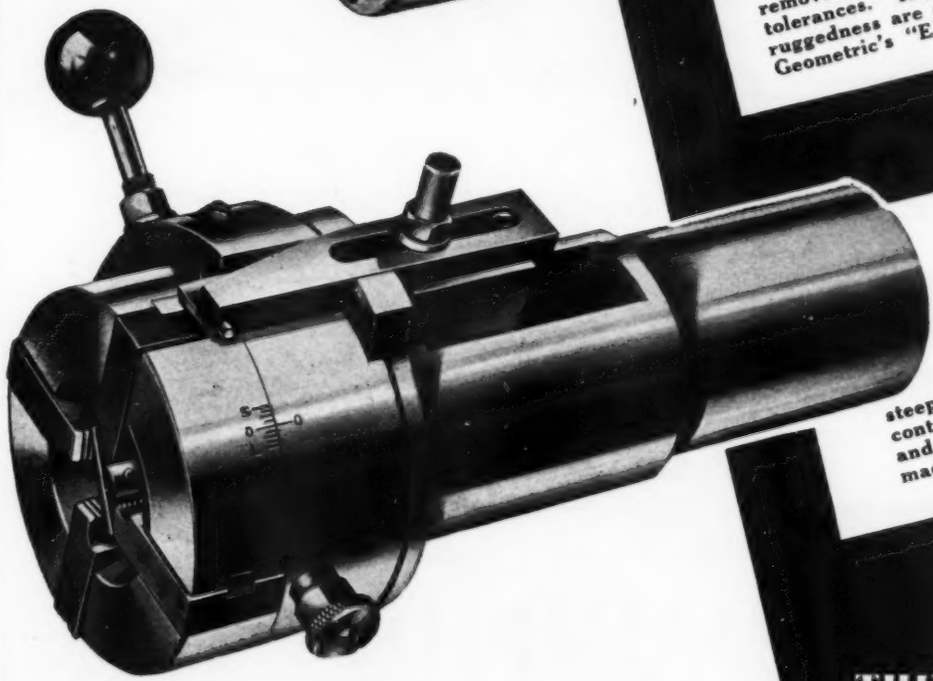
*Built in 9 sizes, all but one of which (9/16") are equipped with roughing and finishing attachment.

GEO MET RIC



FINE THREADS?

This solid adjustable, removable chaser die head cuts threads as fine as 100 per inch, from .050" to 3/16" in diameter. Get the compactness of a solid die with the economy and accuracy of chasers that can be easily removed, resharpened or replaced, and adjusted to close tolerances. High production ability and exceptional ruggedness are combined with precision and economy in Geometric's "EJ5".

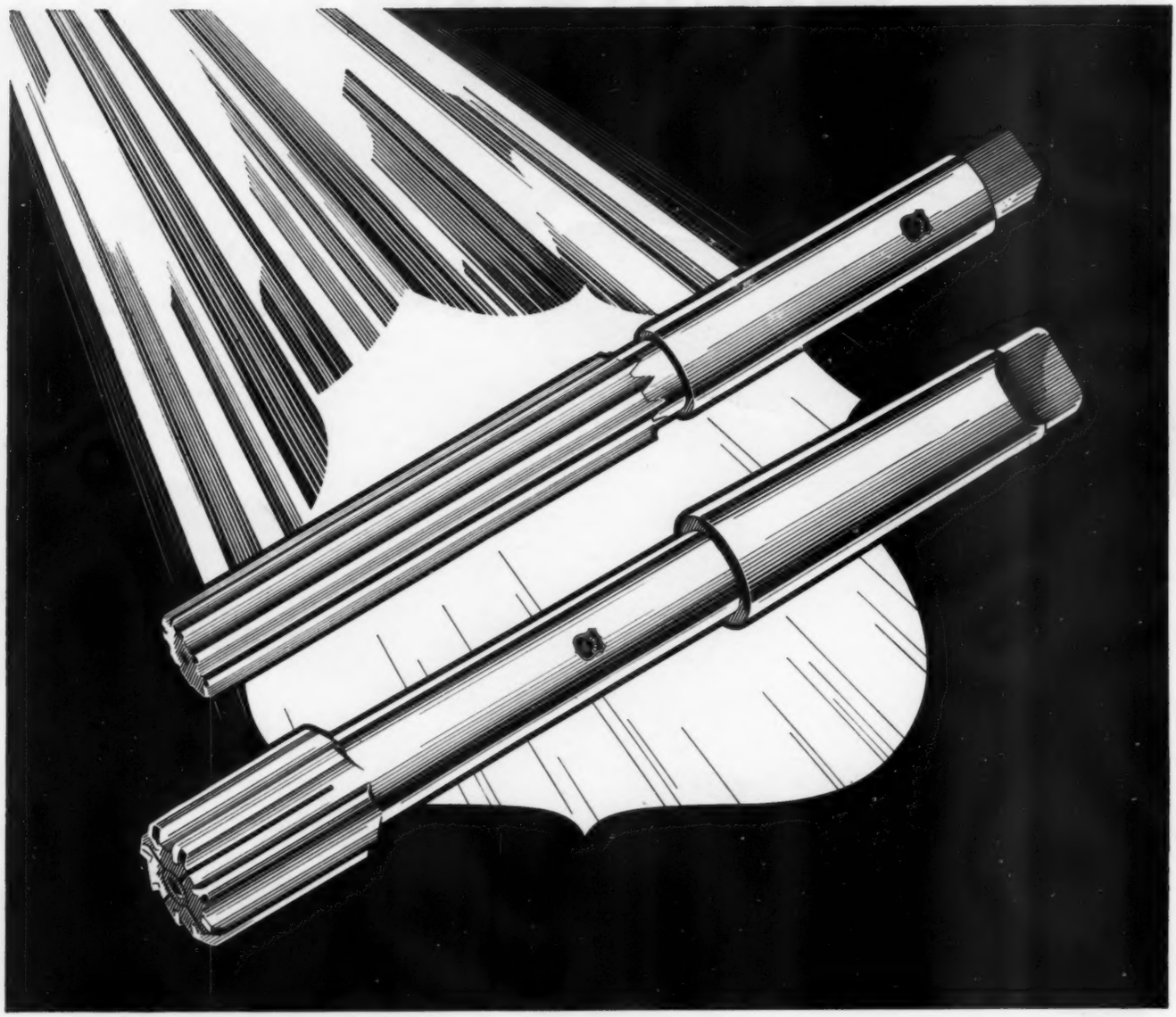


TAPER THREADS?

Designed to cut taper threads as efficiently as other die heads cut straight threads, the C-T Die Head will produce accurate work on tough materials, long, steep tapers, right or left hand threads. Taper is controlled by a positive angle on the taper bar and size adjustments are easily and accurately made.

THE GEOMETRIC TOOL CO.
NEW HAVEN, CONN., U. S. A.

GEOMETRIC



Twist Drills · Milling Cutters
Taps · Dies · Reamers · Drill Chucks
Wheel Dressers · Special Tools

THE STANDARD TOOL CO.

CLEVELAND

NEW YORK • DETROIT • CHICAGO

GORTON PANTOGRAPH DOES 5 OPERATIONS ON INDEX PLATE... *with Unskilled Operator*

GORTON

2-DIMENSIONAL PANTOGRAPH ENGRAVING MACHINE COMPLETES OPERATIONS FROM SOLID STRIP MATERIAL IN 1½ HOURS . . .

● Multiple operations on large runs of duplicate parts can be handled quickly and accurately on Gorton Pantograph Engravers. On this job the manufacturer uses Gorton Single Flute High-Speed Cutters operating at 9,200 r.p.m., and maintains an accuracy of ±.0015″ while profiling. The remainder of the operations are performed with a ¼″ diameter straight shank cutter running at comparable speeds.

The brass index plates made from 3/16″ strip material come to the Gorton Pantograph Engraver with three drilled and countersunk holes. The operations performed are shown on the front and back views of the completed plate.

In addition to work of this nature, the Pantograph Engraver may be used for engraving dies, molds, dials, flat and curved work, and other general engraving, profiling and lettering work.

Gorton Engineers, specialists in engraving, die, mold and stamp cutting, and super high-speed milling, will be glad to make recommendations on your work—without obligation.

PANTOGRAPH DATA

MACHINE—Gorton 3-Z Pantograph Engraver.
PART—Index Plate.
MATERIAL—3/16″ Engraver's Brass.
QUANTITY—300 Pieces.
CUTTER—¼″ dia. Straight Shank Single Flute End Mills.
OPERATION—Engraving, Marking and Profiling complete from solid strip.
HOLDING—Special Jig with "T" Slot Clamp.
FEED—Manual.
SPEED—Top Speed—9200 r.p.m.
TIME—1½ Hours Complete.
ACCURACY—±.0015″.

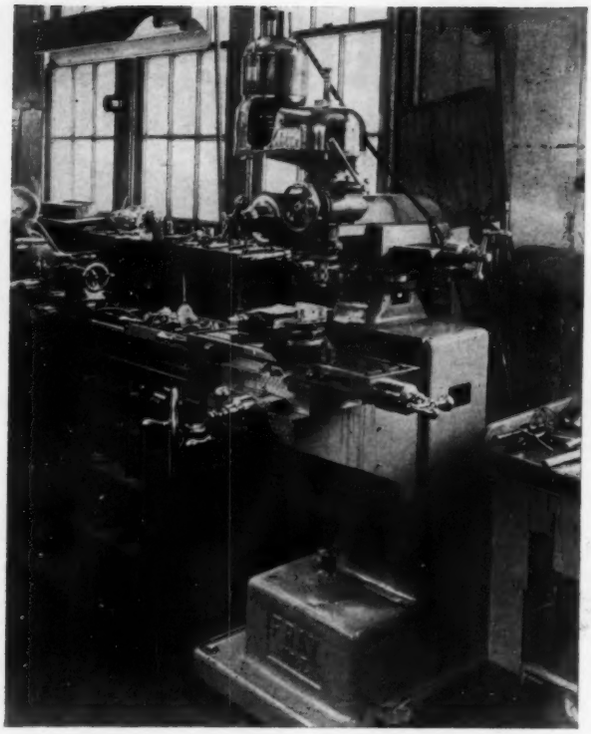
WRITE FOR **FREE** CATALOG No. 1580-A

covering Gorton Pantograph Engraving Machines and Attachments. Also covers other Gorton engraving machines for special purposes.

GEORGE GORTON MACHINE CO.

1315 RACINE STREET, RACINE, WISCONSIN, U.S.A.

SPECIALISTS IN ENGRAVING, DIE MAKING AND SUPER-SPEED VERTICAL MILLING



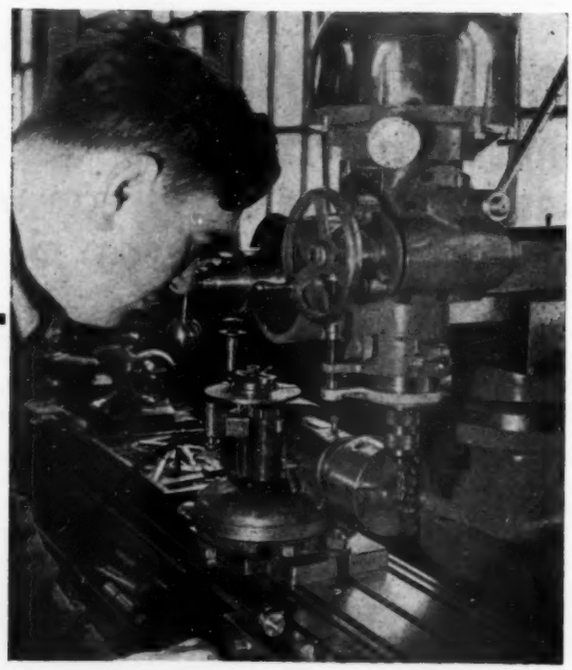
The Chief Engineer of an important San Francisco Plant says the

FRAY No. 7-B Milling Machine IS

"OUTSTANDING IN UNIVERSAL PRECISION WORK"

● At General Engineering & Dry Dock Company, the FRAY Milling Machine does a wide variety of jobs, including milling four-fluted and end mills (lower illustration), milling four-fluted facing cutters, cutting slots in Diesel atomizers, cutting keyways and slots, and many other tool room operations.

The milling machine is set up in the tool room, to take full advantage of the wide range of operations, at any angle, that can be handled with one work set-up. Chief Engineer Frank Fox reports that: "We find this Fray All-Angle Milling Machine outstanding in universal precision work. It is now in use in our tool, die and jig department."

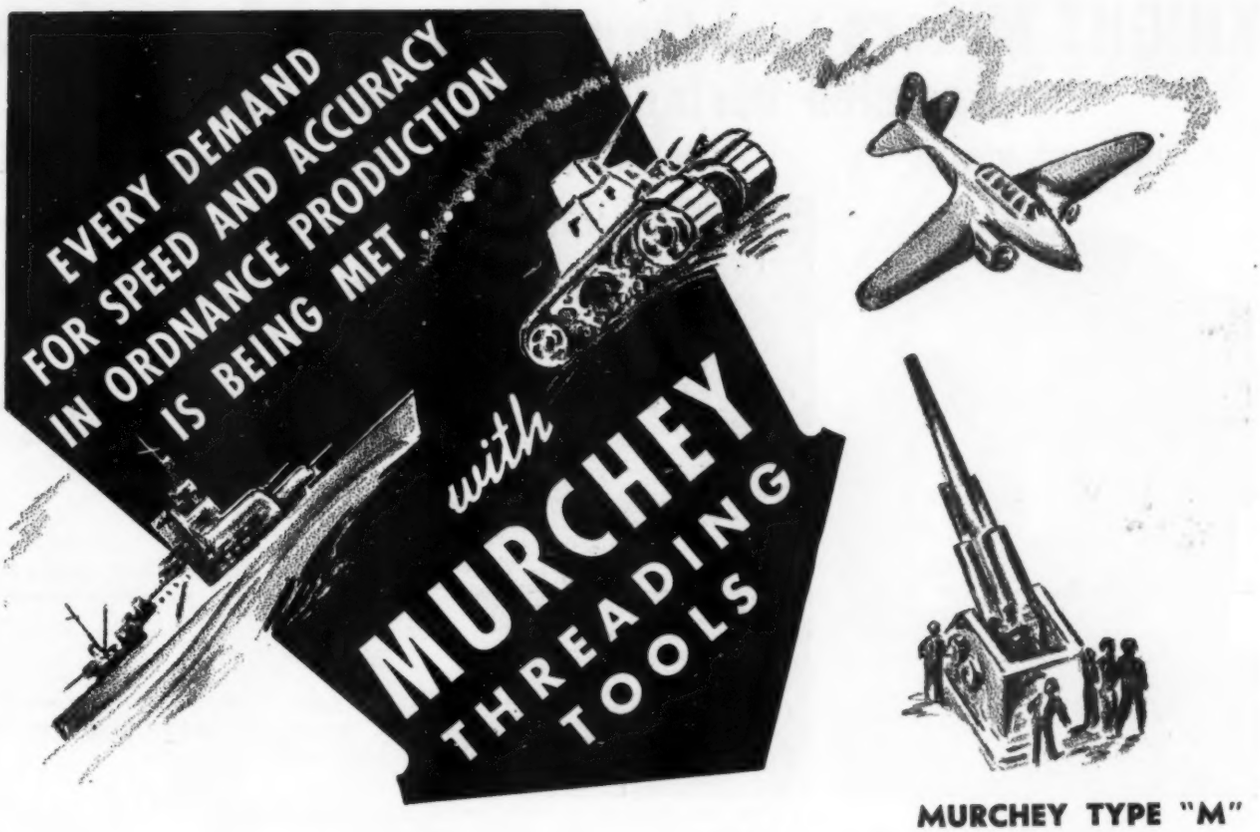


For complete information on Hand and Power Feed Universal Milling Machines, write today.

FRAY MACHINE TOOL CO.

517 West Windsor

Glendale, California

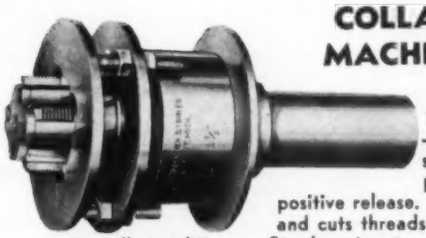


Murchey Tools—designed and built for fast, low cost, accurate thread production—are fulfilling the most exacting requirements in plants busily engaged in turning out arms and ammunition at top speed.

Long since proved for economy and stamina under normal production demands, Murchey Tools, by their outstanding performance in today's production race, are demonstrating their soundness in design and construction for tough service. Consult Murchey on your defense production threading problems.

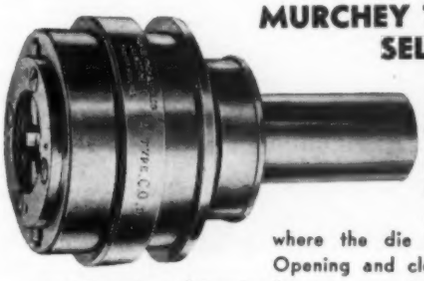
MURCHEY ALSO MANUFACTURES
Thread Milling Machines, and Shell Tapping Machines.
Write for detailed information.

MURCHEY TYPE "M" COLLAPSIBLE MACHINE TAP



This universal tool—for tapping straight threads—provides instant, positive release. It is fast in action and cuts threads to accurate length under all conditions. Sturdy, strong and adjustable for thread sizes, the Type "M" is a fast tool on any thread cutting job.

MURCHEY TYPE "C-O" SELF-OPENING DIE HEAD



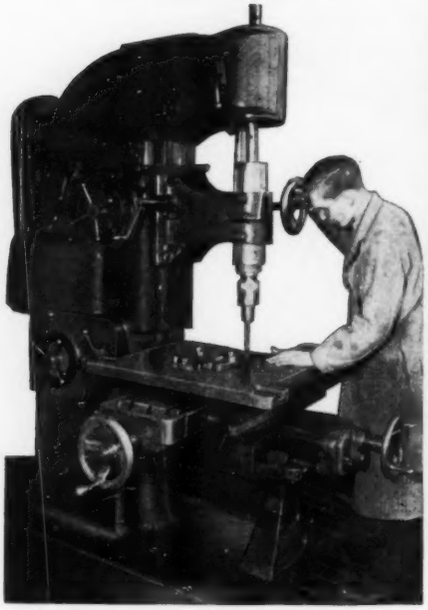
This rugged, compact tool is designed for use on any machine where the die head is revolved. Opening and closing are positive; opening at predetermined point guarantees accurate thread lengths. All parts are hardened and ground. Simple and sturdy in construction, the Type "C-O" assures long-lived service and accurate performance.

Investigate Today!

Murchey MACHINE & TOOL CO.
.....DETROIT, MICHIGAN

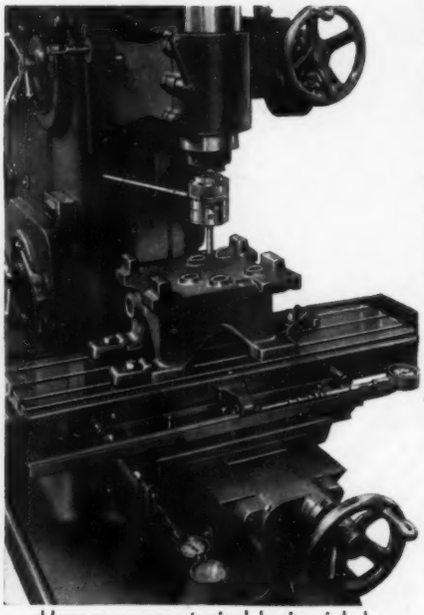
KNIGHT Millers have the necessary requirements for precision borings of jigs and fixtures . . .

DRILLING HOLES



Holes are being drilled in a large die plate before the next step which is boring. Dial indicator is being used on longitudinal movement to locate holes quickly and accurately without preliminary layout.

BORING JOB



Here you see a typical boring job being done on a KNIGHT Miller. With dial indicators, all five holes were accurately located and bored. At the same setting the corner pads were milled, insuring squareness with the bored holes.

Read about these features and others in catalog—

- **BALANCED DESIGN:**

A balanced unit that gives the maximum of service without sacrificing one quality for another.

- **RIGIDITY:**

Firmness that insures high standards of workmanship and production volume.

- **ACCURACY:**

The result of design as well as precision of workmanship and the quality of materials used.

- **VERSATILITY:**

Capabilities which greatly simplify many set-ups that would otherwise be difficult to obtain.

- **ACCESSIBILITY:**

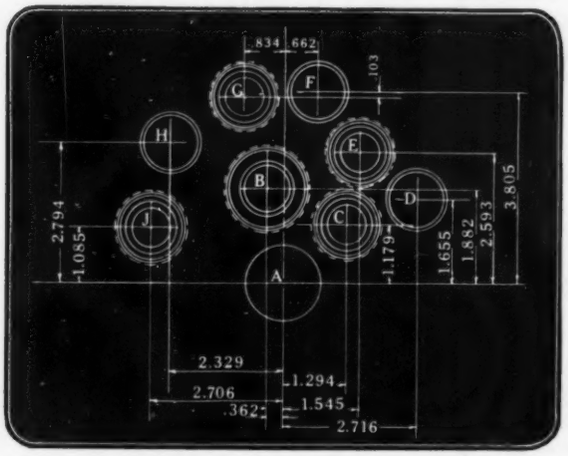
From either a sitting or standing position, the operator always has a clear vision of the job—one set of simple, convenient directional controls, for both hand and power operation, within easy reach.

- **CAPACITY:**

Sixteen changes in speed, in either direction, give the spindle ample range to meet a wide variety of requirements.

- **PRECISION BORING:**

KNIGHT Millers have the necessary requirements for precision boring of jigs and fixtures, and for accurately locating and boring on a production basis where it is not economical to make special tools.



Time and Money SAVED

Here is an example of how you can save time and money with a KNIGHT Miller doing precision boring. Although most of the holes had several different diameters to be bored, they were all done in four and one half hours or thirty minutes to the hole from the solid piece. The spacing from one hole to the other was held to limits of plus or minus .0002".

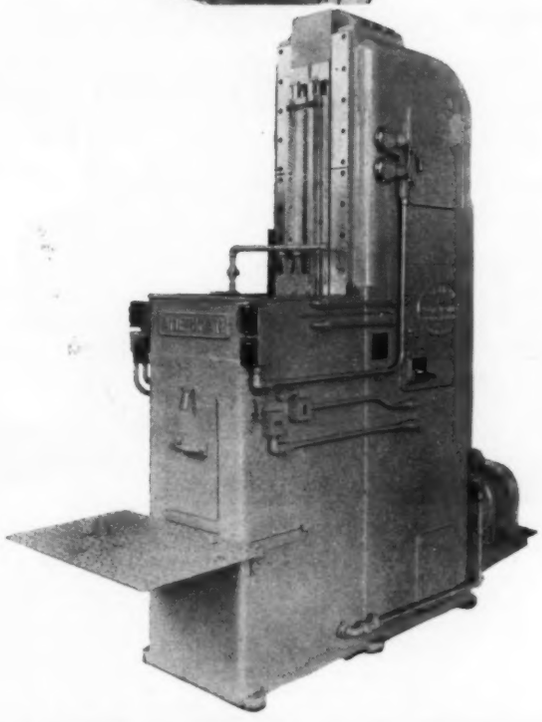
KNIGHT Millers are not single purpose machines designed for precision boring only. Though they are so well adapted to and capable of handling precision boring, at the same time, they are equally well adapted to other types of machining operations without impairing the accuracy of the machine for jig boring. KNIGHT Millers are fast, compact, complete, and convenient to handle, with plenty of power and capacity to do the most exacting jobs you demand of milling machines.

KNIGHT VERSATILE MILLERS ACCURATE RIGID

WRITE FOR NEW CATALOG

W. B. KNIGHT MACHINERY CO.
• ST. LOUIS, MISSOURI •

AMERICAN *Goes Over The* TOP



AMERICAN has gone "Over the Top" in supplying war manufacturers with suitable broaching equipment. We have supplied complete machines and tooling for rapid production of parts for planes, tanks, guns, ships, shells, trucks and bombsights. We have drawn upon every ounce of ingenuity and years of past experience in order to produce machines and tools which will give the utmost in production and satisfactory performance.

Shown to the left is an AMERICAN SB-42-5 ton single ram surface broaching machine arranged for broaching split line on aircraft bearings. This machine is provided with a special work table and the part is clamped by hydraulic pressure. High production is obtained.

AMERICAN BROACH & MACHINE COMPANY

ANN ARBOR, MICHIGAN, U. S. A.

BROACHING MACHINES, PRESSES, BROACHING TOOLS, SPECIAL MACHINERY

Division of SUNDSTRAND MACHINE TOOL CO. ROCKFORD, ILLINOIS, U.S.A.

H & G

For MORE and BETTER THREADS

PER DAY . . . PER MAN . . . PER MACHINE!

H & G Insert Chaser Die Heads do a beautiful threading job on the tough alloys specified today. The consistent quality and accuracy and extraordinary long runs establish new high standards. When chasers get dull, a new set is dropped in place, ready to run, with no more bother than inserting a new blade in a safety razor. Non-production time for both operator and machine is reduced to a minimum—decreasing costs and increasing earning power—like gaining an hour a day.

STYLE SAMA Solid Adjustable Die Heads

use the same Insert Chasers as H & G opening heads. You get marvelous results on B & S Automatics and on tapping machines. Threads are excellent quality with very long runs per grind. Sizes: 00, 0-3/8", 17/32-3/4", 25/23-1" for B & S.

PROMPT DELIVERIES

New Bulletin **"VICTORY SCREW THREAD Data Book"**

INCLUDING FOREIGN THREAD SYSTEMS

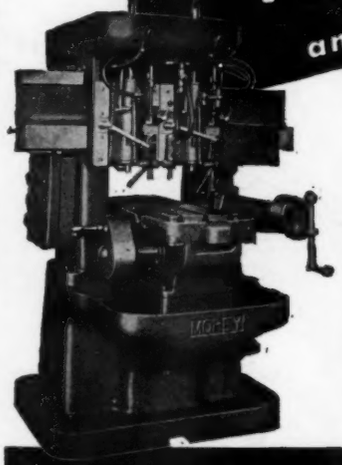
Available to factory executives upon request on business letterhead; others 15 cents

THE EASTERN MACHINE SCREW CORP.

20-40 BARCLAY ST., NEW HAVEN, CONN.

Preloaded Precision Bearings for Spindles

MOREY 12M HIGH-SPEED VERTICAL PROFILER and MILLER



Two spindle or single spindle

Speed and more speed in the production of interchangeable parts requiring milling of any contour or outline is yours in the MOREY 12M. Provision for increased clearance between spindles and table.

Ask for Bulletin 680-A

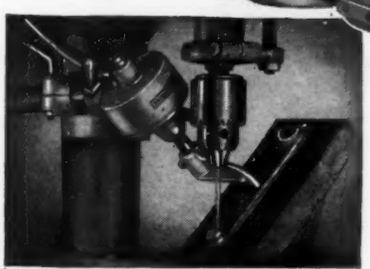
MOREY MACHINERY CO., INC.

410 Broome Street New York, N. Y.

NEW MEAD AIR-CLAMP

For **GREATER DRILL-PRESS OUTPUT**

PROMPT SHIPMENT



WHEREVER a drill comes down, *something* must hold the work. Wherever a drilling-jig is required, *Air-Clamp* will simplify it. Wherever *speed* is desired, *Air-Clamp* will produce it. *Air-Clamp* holds with relentless pressure; it is undisturbed by size variations (such as in castings), it scoffs at vibration (how many drills have been broken due to faulty holddowns?), chatter, snagging. *Air-Clamp* holds work of any size or shape in any position, at any angle. It can pay for itself on a single fixture; it can save its cost on a few days' drill-press output. It reduces operator fatigue. It saves hours and dollars in drafting-room, jig department, tool room and production line. *Air-Clamp* fits any drill-press having a cylindrical column. Special fixtures for Tee-slotted tables, light milling work, etc. Hand and/or foot control.

Shipped on approval to responsible concerns.

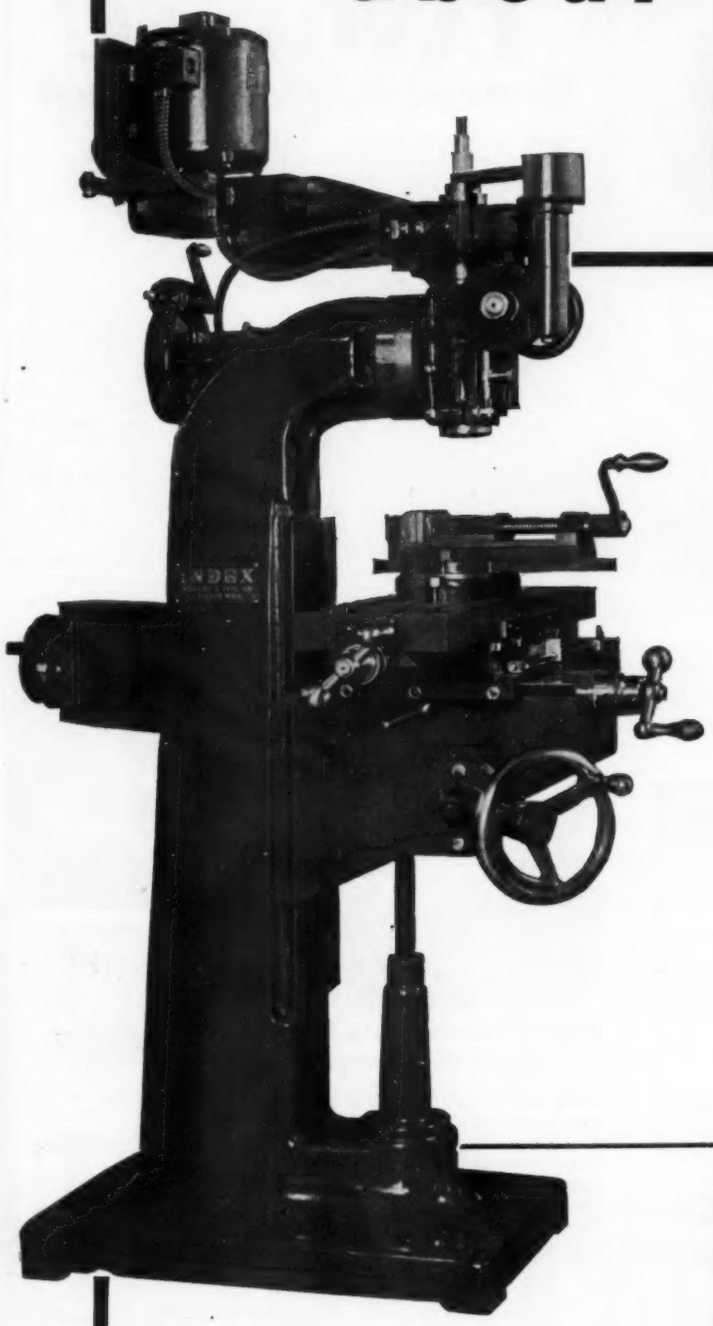
FOOT AIR CONTROL READY!

For air-operated devices. Frees hands—speeds up work! Two types: Model "ON" releases work when pedal is pressed . . . Model "OFF" holds work when pedal is pressed. Low priced. Write!

MEAD SPECIALTIES CO.

15 South Market St., Dept. 8-MA, Chicago

What do you know about INDEX MILLS?



● Do you know what INDEX MILLS can do? Ask the man who runs the small shop down the street, or that foreman you know who works in the tool room of that big plant now making munitions . . . chances are they both can tell you.

For versatile INDEX MILLS find application in both places . . . as a production machine for large runs in big plants or a job lot unit in small shops. And they are *delivering* in both cases!

It's really simple to explain — INDEX MILLS were specially designed and built to turn out the best milling, drilling and boring work for the smallest machine investment — yet accuracy was not sacrificed.

You can find INDEX MILLS working today, turning out end mill work up to ⅝" in tool steel . . . boring 3" holes in steel . . . speeding hole location through verniers.

You need this kind of performance today, and our price is extremely reasonable! Write for a folder and quotation at once!

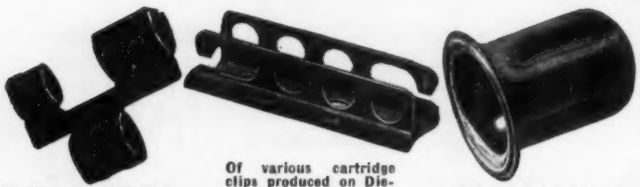
BLANK & BUXTON MACHINERY CO.

3106 E. MICHIGAN AVE. • JACKSON, MICH.

INCLUDING BROACHING

Airplane fuselage hinge of dura-fumin produced complete per stroke on the Dieing Machine in continuous strip to high precision limits.

For bombers and bombs, precision stampings COMPLETE PER STROKE



Machine gun belt link produced complete one per stroke to extreme precision limits at exceptionally high speed.

Of various cartridge clips produced on Dieing Machines, this one is for caliber .303 rifle, produced complete one per stroke at new high rate.

This shell, involving 8 operations, is produced complete one per stroke at high speed, with 1⅜" draw.

Stampings produced complete per stroke on the unique Dieing Machine include many items for airplane fuselage, instrument and engine parts. In the endless variety of munitions items made on these automatic presses, are high-precision bomb components such as detonator parts, primer stampings, and automatic time and contact fuse parts and assemblies. Throughout the field of stampings essential to the war program, H & W Dieing Machines are providing an unmatched combination of high production and high precision of stamped product, one Dieing Machine replacing 5 to 10 conventional presses. At speeds up to 600 s.p.m., 1 to 20 completed parts are produced per stroke. Capacities: 10 tons to 300 tons.

Request Catalog 42

Munitions Stampings of endless variety

STAMPINGS

- Mechanical time and contact fuse parts
- Rifle components
- Cartridge clips, or rifle chargers
- Gas mask stampings
- Ammunition stampings
- Bomb components
- Shell parts
- Detonator stampings
- Airplane instrument engine and fuselage parts

OPERATIONS

- Bullet assembling
- Primer inserting
- Automatic time and contact fuse assemblies

THE HENRY & WRIGHT MFG. CO.

486 Windsor St. Hartford, Conn.

Henry & Wright Dieing Machines

FAVORITE*

Reversible Ratchet Wrench

Profit by the experience of the many plants that have compared Favorite Wrenches with ordinary wrenches and have found that Favorites tighten nuts 75% quicker and make them tighter. Speed up your assembly operations on apparatus and pipe lines by using Favorites — the only socket wrench that accommodates two different sizes of nuts with each head.

Three sizes of handles: each handle takes five different heads; each head fits two different size nuts. Write for circular and prices.

Buy from our Distributor

GREENE, TWEED & CO.

Bronx Blvd. at 238 St., New York, N. Y.

*Reg. U. S. Pat. Off.

Makes America's Hands More Productive

These time-proved units help you speed up War Products output by assuring faster handling of assembly and sub-assembly work, conserving space, guarding against accidents and guarding against fire and sabotage losses. Write for catalog.

LYON METAL PRODUCTS, INCORPORATED

General Offices:

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LYON METAL PRODUCTS, INCORPORATED

HYDRAULIC ARBOR PRESSES

—are as FAST as ...

SPIN THE HANDWHEEL and the ram speeds to the work by fast mechanical action instead of slow, laborious hydraulic pumping.

FLIP THE BALL ARM to close the valve instead of slowly turning a handwheel type control.

START PUMPING and immediately get tons of pressure on the work because the hydraulic cylinder was automatically filled with oil during oper. No. 1.

● With Time so terribly short, every second saved in any operation adds greatly to our War effort. The built-in Speed of KRW Presses is as Fast, and simple, as A B C. KRW Hydraulic Arbor Presses are fast bringing the ram to the work... fast in developing hydraulic pressure... fast in raising the ram to remove the work. Another time and labor saving KRW feature is the stationary bed adjustment control... no matter where you move the bed, the ratchet control crank remains at convenient operating height. Write for bulletin describing 25, 50 and 75 ton presses... priced from $198.00*.

**Prices F. O. B. Arcade, N. Y. Slightly higher west of Rockies*

K. R. WILSON

MAIN OFFICE: LOCK ST., BUFFALO, N. Y., U. S. A.
EXPORT OFFICE: 90 WEST ST., NEW YORK, N.Y., U. S. A.
WEST COAST: Osborne Mach. Co., San Francisco, Calif., U. S. A.
Smith-Booth-Usher Co., Los Angeles, Calif., U. S. A.

MAIL THIS COUPON

K. R. WILSON, 38 Lock St., Buffalo, N. Y.
Please send Hydraulic Arbor Press Bulletin No. 38.

Name .....
Address .....
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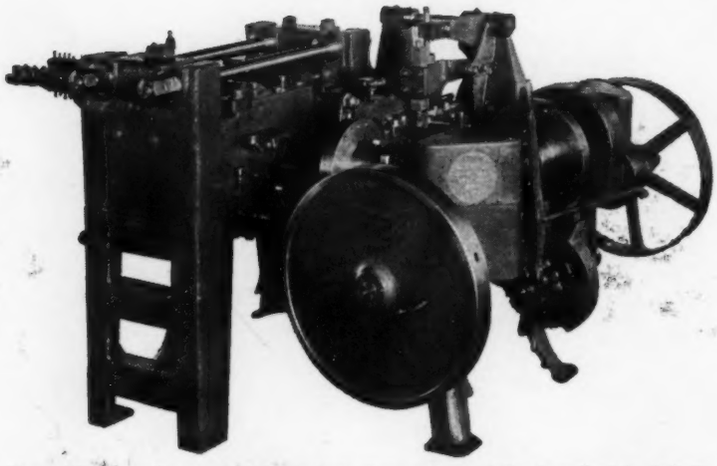
HANDLE YOUR SWAGING, STAMPING, PIERCING, BLANKING and FORMING of COILED METAL

ON THE **NEW NILSON AUTOMATIC PRESS and FOUR SLIDE MACHINES**



These Nilson machines are built in two sizes and are fully described in Bulletin No. 90, available promptly on request.

. . . for fast, heavy duty work

An outstanding feature of these combination power press and four slide machines is the powerful, silent action of the main press slide which is operated by crank motion through toggle or knuckle joints. Overhead stay rods contribute to the tremendous strength and rigidity of this machine.

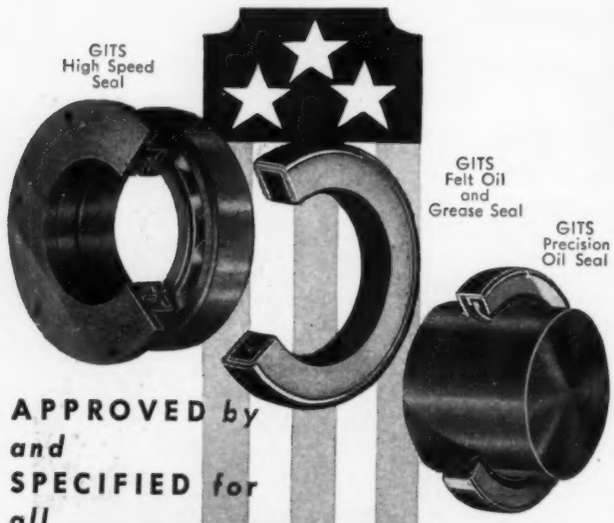
Other features include simple and easy changing of accessible and removable die set, open construction of forming slides and tool adjustments made without interference.

●

Nilson's more than 30-year experience in the design, development and manufacture of special, high production automatic machinery is available to assist you in producing any special machines you may require. Consult our engineers and be assured of a comprehensive service.

●

THE A. H. NILSON MACHINE CO. . . *Bridgeport, Conn.*



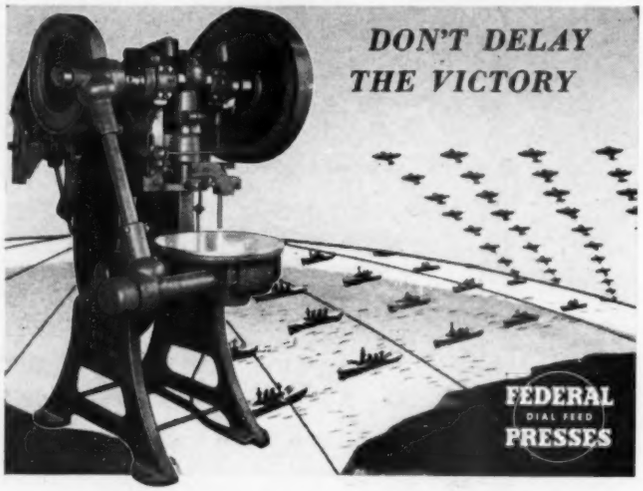
APPROVED *by and* SPECIFIED *for all* **MECHANIZED UNITS**

We realize, as does all America, that the mechanized units of our air, land, sea and industrial forces must be dependably maintained to their exceptionally close original tolerances and standards of efficiency to insure Victory. Gits Oil and Grease Seals are providing a major essential to this cause—that of positive bearing protection under all conditions, and in the future, Gits will continue to foster new lubricating developments.

GITS BROS. MFG. CO.

1857 South Kilbourn Avenue • Chicago, Illinois

30 years of oil cup experience



SPEED PRESS OPERATIONS WITH FEDERAL DIAL FEEDS

DON'T let incompetent press equipment delay victory! *Speed up* many operations *3 to 6 times* by using Federal precision-built presses with multiple dial feeds. Positive indexing and locking mechanism smooths out action of dial — permitting unusually rapid production with exceptional accuracy and safety to the operator. Easily indexed to any part of the crankshaft revolution from 90° to 180°, giving long or short dwell of the dial. Cannot skip or coast by stations. Available in eight sizes of Federal Presses. Write for facts today.

THE FEDERAL PRESS CO.

608 Division St., Elkhart, Indiana.

Many Federal Models

Federal Open-Back, Inclinable Presses are available in nine sizes, with capacities ranging from six to 80 tons—either flywheel or geared type. They represent the culmination of Federal's 40 years' intensive experience in press building.

TAYLOR-WILSON

SIZES
1" to 24"
DIAMETERS

Cutting-Off Machines

Forced war-time production has demonstrated the ability of Taylor-Wilson Cutting-Off Machines to operate at sustained high speed without distress, variation of close tolerance or noticeable wear. All parts are built for heavy duty speed and precision. The machines will cut tubing made of all grades of steel within the limitations of modern cutting tools. Simple and economical in operation with one-man control.

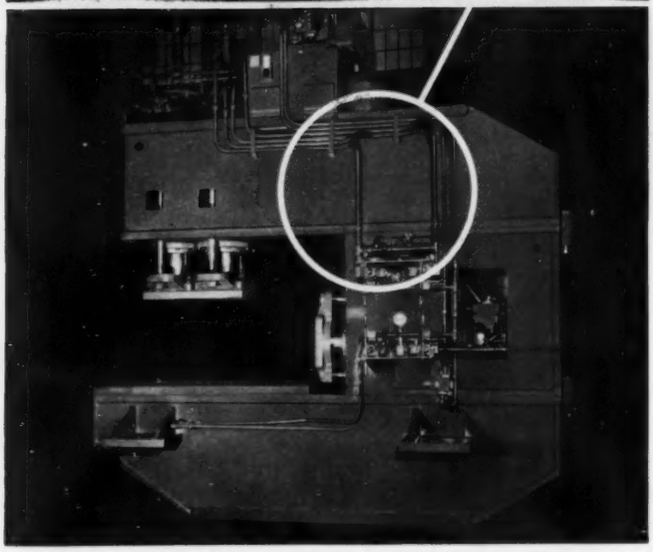
Write for descriptive literature

FOR CUTTING OFF PIPE OR TUBING IN SET LENGTHS

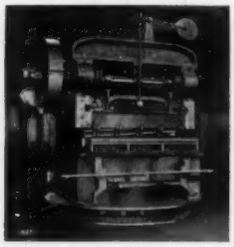
FOR COUPLING STOCK ROLLER BEARING BLANKS, BOMB BLANKS AND OTHER PRODUCTION ITEMS

TAYLOR-WILSON MFG CO.
35 Thomson Ave., McKees Rocks, Pa.
PITTSBURGH DISTRICT

"ICE WATER in its VEINS?"



Incorporating the latest type pump and valve design, this newly designed BEATTY Hydraulic Flanging and Forming Press *eliminates* the need for cooling coils . . . and the acute *danger* that a leak in these cooling coils would allow water to enter the oil supply tank. Available in capacities up to 750-Ton; widely used in the shipbuilding, tank, aircraft, railroad car and other *vital war* industries. If your production calls for punching, coping, shearing, flanging, forming or the like, let a BEATTY *Engineer* show you how this and other units in the BEATTY line could help *solve* your *production problems*. No obligation.



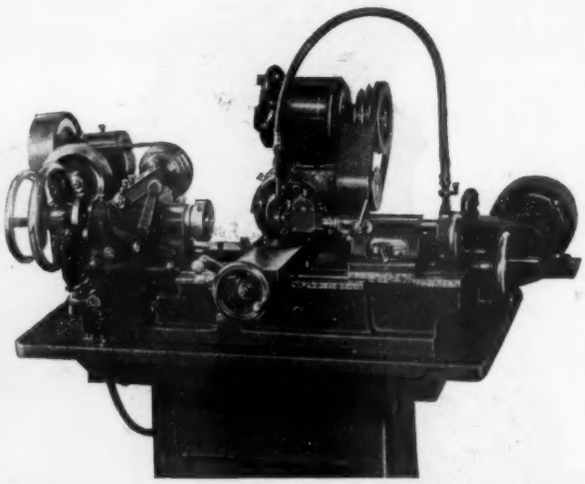
BEATTY HEAVY PLATE SHEARS

Ruggedly built and reinforced at points of strain to make accurate shearing possible. Quickly, easily adjustable. Provides safety springs, automatic hold-down, wide working table. Built in full range of sizes.

Beatty Engineers will welcome the opportunity to help you solve your metal fabricating problems.

BEATTY MACHINE AND MFG. COMPANY HAMMOND, IND.

Builders of Heavy Metal Working Tools



WALTHAM THREAD MILLER

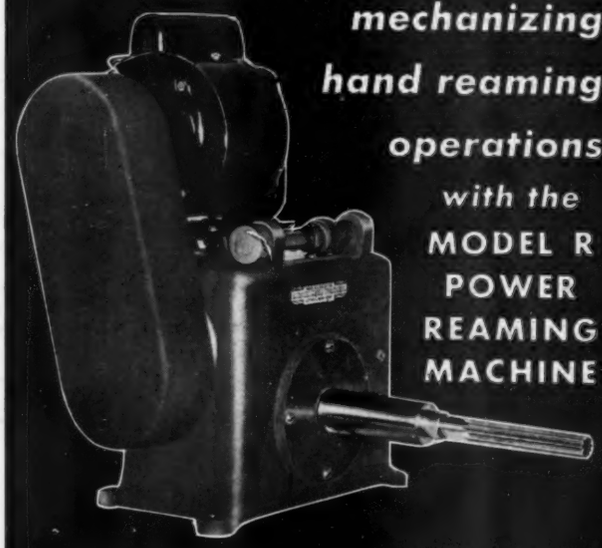
WITH 3 MOTOR DRIVE

A semi-automatic machine for production or tool room service. It is best adapted for work 2" in diameter or smaller. Special equipment for short multiple cutter work with cam shaft control can be furnished. A cutter head for internal work can also be supplied.

WALTHAM MACHINE WORKS

HIGH STREET WALTHAM, MASS.

Speed your work by mechanizing hand reaming operations with the MODEL R POWER REAMING MACHINE



This small, compact machine will enable you to put hand reaming on a production basis and save time, effort and money.

The Model "R" is ideal for removing burrs after keyseating or tapping as well as for highly accurate finish reaming. Easily portable for use at most convenient location. Plugs into nearest outlet. Capacity up to 1 3 16" diameter. Speeds 95, 120 and 165 R.P.M. Bench and pedestal types. Moderately priced. Full details on request.

Investigate Today!

CATSKILL METAL WORKS, INC.

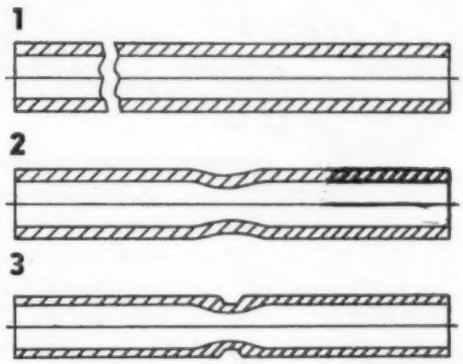
CATSKILL NEW YORK

HERE'S HOW *Swaging* EASILY SOLVED THIS PRODUCTION PROBLEM . . .

. . . ANOTHER CASE WHERE SWAGING BY ETNA IS SPEEDING VITAL ARMS OUTPUT!

Briefly, this job required the placing of a ring around a piston rod made from tubing (1). If a line were grooved around the tubing, the tubing wall at the point of the groove would be dangerously thin. Therefore, a band was SWAGED around the tube (2), then machined, so that plenty of material was left on the inside of the tube (3), and the ring could be safely and satisfactorily applied.

This operation represents another case where the application of swaging not only solved a production predicament, but speeded the all-over operation as well. If you are faced with similar problems which involve the sizing, tapering or reducing of round solids or tubing, do as this manufacturer did . . . call on ETNA. Swaging machines by ETNA are built for diameters from 3/8" to 8", die lengths from 1" to 18".



IF IT'S A QUESTION OF TAPERING, SIZING OR REDUCING OF ROUND SOLIDS OR TUBING

"Ask ETNA about Swaging"

THE ETNA MACHINE COMPANY

TOLEDO . . . OHIO

TAKE THE BOTTLENECKS OUT OF YOUR COLD METAL SAWING OPERATIONS

Cut your 3 inch and larger stock on the PORTER-McLEOD *and save time*

This new machine provides an economical means of handling your cutting off operations on a high production basis. More cuts, greater accuracy and lower operating and maintenance costs are outstanding advantages offered you by the 8" Porter-McLeod Cold Metal Sawing Machine.

This machine is recommended for general work and for production work in single or multiple units. Its capacity permits of "nesting" bars and shapes using the Porter-McLeod systems of "multiple or interchangeable nests" which provide support for each nest on both sides and bottom. By this method of nesting of bars and shapes, multiple units can be cut at one time and work speeded up.

Ability to cut stock from 3 inches and up at high speed and with straight cuts is made possible by the Porter-McLeod method of pulling the blade upward through the stock and by supporting the blade, front and back on diameters well out from the center where support is needed.

These and other outstanding valuable features are fully described in engineering bulletin available on request. Send for your copy TODAY!

PORTER-McLEOD MACHINE TOOL CO., INC.

HATFIELD, MASS., U. S. A.

MACHINE TOOL COMPANY

Labels

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PREVENT COSTLY MISTAKES!

RETURN THIS BLUEPRINT TO PLANNING DEPT.

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Please send me gratis "War Production" labels and how they are used.

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EVER READY LABEL CORP.

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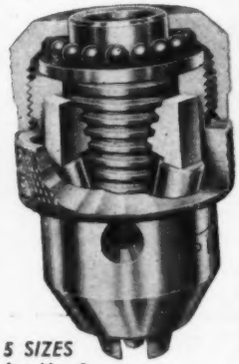
The "key" to higher drilling production is

Ettco-Emrick KEYLESS DRILL CHUCKS



5 SIZES for No. 0 to 5/8" drills

Key tightening of drill chucks is a non-productive operation that eats up valuable time and energy. And it's an **unnecessary** operation because you can get drill chucks that eliminate key tightening—Ettco-Emrick **KEYLESS** Drill Chucks—designed to let drilling action do the tightening. What's more, you get this important advantage in chucks as fine from every mechanical standpoint as any you can buy!

FOR PORTABLE DRILLS

Ettco - Emrick KEYLESS Drill Chucks are stocked to fit all makes of portable drills.

GET FULL DETAILS IN BULLETIN No. 6
Copy mailed to you on request.

ETTCO TOOL CO., Inc.
590 Johnson Ave., Brooklyn, N. Y.
Detroit • *Chicago*

MAKERS OF *Ettco-Emrick* DRILL CHUCKS • TAP CHUCKS
MULTIPLE TAPPING AND DRILLING HEADS
TAPPING ATTACHMENTS • TAPPING MACHINES

3 Ways to Save with Peerless Power Saws

PEERLESS 6" High Duty Saws with Hydraulic Feed are cutting SAE 1055, 485 Brinell shell stock after forging and piercing.

Pressure cannot build up — blade life is lengthened.

MANPOWER . . . TIME . . . METAL — all three elements are important in winning a battle or a war — all three elements effectively are conserved when the SAWING is done on a Peerless High Duty Power Saw.

The eight Peerless, High Duty Saws in action here are fully controlled hydraulically. The cutting cycle repeats automatically with minimum attention. Wartime MANPOWER effectively is conserved.

PRECIOUS WARTIME HOURS also are made more productive when Peerless Saws do the cutting. Peerless has the exclusive Four-Sided Saw-Frame with Backing-Plate Blade-Support. Faster cutting is practical — blade life is lengthened.

METAL, too, goes farther when it is Sawed to thousandths the Peerless way. The thin, cool-running, straight-cutting blade removes as little as 1/16" of the material. Even this fine "steel-dust" is easily salvaged from the chip tray.

All three savings* — savings in **MANPOWER . . . TIME . . .** and **METAL** are contributing much to the war production effort while helping more people save for War Bonds. More about this 3-way saving will be mailed on request.

PEERLESS MACHINE COMPANY • RACINE, WISCONSIN

Peerless
METAL SAWING MACHINES

PEERLESS MACHINE COMPANY, Dept. AM-842, Racine, Wisconsin

*Mail complete details on automatic performance.....

☐ Mail catalog on Hydraulic type Saw for High Production Cutting
☐ Mail catalog covering Vertical type used for Die Block Work
☐ Mail catalog on Mechanical type Saw for production cutting
☐ Mail catalog on general utility and maintenance Saws

Company.....

Individual.....

Street.....

City.....State.....

FAST, ACCURATE CUTTING DEMANDS POSITIVE BLADE CONTROL

A COMPLETE ENGINEERING SERVICE

WITH MORE THAN 150 ENGINEERS FOR

PROCESS & METHODS
TOOL DESIGN
MACHINE DESIGN
PRODUCT DESIGN
ENGINEERING COUNSEL

OUR REPRESENTATIVE WILL GLADLY CALL AT YOUR REQUEST

GEORGE SCHER ENGINEERING CO.

115 FIRST ST. NEWARK, N. J.

There's a Production Bonus in

It may be costing you production and profits to think "all Carbide Tools are alike". They're NOT!

There are as many differences among carbides as there are among steels. These differences affect hardness, density, uniformity and cutting qualities. Your eye can't detect the quality of a carbide tool—but you can very quickly see it in your production records.

TECO CARBIDE TOOLS have a background of long experience and carefully controlled development that offer the users a definite production bonus.

Prove it with a test run. Keep a record of the additional pieces you obtain per grind—the maintenance of accurate tolerances for longer runs—the reduction of rejects. Grades and styles for practically every machining need. Let us know your requirements.

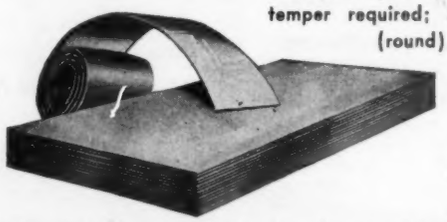
TECO CARBIDE TIPS FOR PROMPT SHIPMENT. Standard grades, styles and sizes.

TUNGSTEN ELECTRIC CORPORATION
568 39th Street • • • Union City, N. J.
Branch Office: 2906 Euclid Avenue, Cleveland, Ohio
Pioneers in Tungsten Carbides for Over a Quarter Century

Include in your design
--- and *Specify*

ELEPHANT BRAND PHOSPHOR BRONZE

Wire • in coils for spring manufacturers; Flat wire, in coils or lengths; Tinned binding, for armature work; Binding wire (round), dead soft to any temper required; Straightened (round), in lengths.



Sheets • in rolls; Slit sheet metal, tinned both sides— in various gauges and tempers covering a broad range of uses.

The PHOSPHOR BRONZE SMELTING CO.
2218 Washington Ave. Phila., Pa.
"Original manufacturers of Phosphor Bronze in the U. S. A."—Established 1874

SHEETS • WIRE • RODS • ROPE • INGOTS • CASTINGS • BUSHINGS

THE WAR CAN'T WAIT..

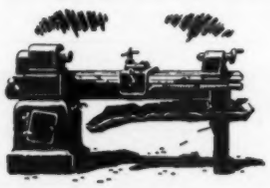
Donald M. Nelson says to the Machinery Industry:

"America's rising war production program must not be hamstrung by the present shortages of strategic scrap materials—iron, steel, rubber, tin, copper, brass, lead, zinc, burlap, rags, and rope. We need the immediate help of every machinery and machine-tool plant in the country to whip this problem. Now is the time to condemn unusable old plant buildings, to junk obsolete tools and equipment, and to round up odds and ends of valuable scrap. We urge you to begin *at once* an all-out drive for scrap!"

U.S. NEEDS ALL SCRAP..TODAY!

SELL YOUR SCRAP TO SHORTEN THE WAR!

HERE'S WHAT TO LOOK FOR



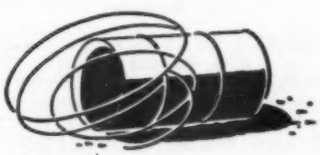
WORN-OUT LATHES . . . millers, hobbers, planers, or their parts. Practically every machine shop has at least one old machine kicking around as a spare part reservoir. Remove the parts you need. Send the rest to the front as scrap!

PRESSES . . . Thousands of tons of unusable forging, drill, and sheet metal presses are cluttering up plant premises. Rout out the worn pistons from steam cylinders. Hunt down broken and obsolete dies. Just one badly-worn hydraulic plunger may provide scrap enough for three 500-lb. aerial bombs!

CUTTING TOOLS . . . broken, battered, worn-out. Turn them in. There is no finer alloy steel made—just the thing to give our boys the fighting weapons they must have. These tools yield scarce tungsten, nickel, and chromium.

GEARS AND BEARINGS . . . Nothing is too small to be valuable. Remember that every 27-ton medium tank requires 28,000 lbs. of scrap steel.

BOLTS, RIVETS. Round up odds and ends. Small parts quickly make a useful quantity. Old chains, battered tote boxes, line shafting, pulleys, and hangers should be torn down and scrapped.



STEEL OIL DRUMS, WIRE . . . A 50-lb. steel barrel furnishes scrap enough for a .50-calibre machine gun. Sixty feet of electric cord provides copper for 1,000 37-mm anti-aircraft shells. Don't burn insulation—the rubber is needed!

HERE'S WHAT TO DO . . . Appoint one man as Salvage Manager for your organization. Give him authority to *act*—to condemn old equipment, to move material, to collect scrap of all kinds. Have him separate all scrap by type. Then move it promptly through your regular scrap dealers. Don't wait—start rounding up scrap *now*—and keep it moving until the war is won!

THROW YOUR SCRAP INTO THE FIGHT!

This message approved by Conservation Division

WAR PRODUCTION BOARD

This advertisement paid for by the American Industries Salvage Committee (representing and with funds provided by groups of leading industrial concerns).

CONTRACT WORK

Advertisements on this and the following page are placed here by well-known concerns doing work on a contract basis. When you need assistance write to these established manufacturers.

SUB-CONTRACT FACILITIES FOR

Hand screw machine products.

Engine and bench lathe, milling and drill press work.

Small sheet metal fabrications to closer than commercial tolerances.

Stampings.

We do our own tooling.

RELIANCE MACHINE & MFG. CO.
Thirty Irving Place New York City
36 years experience in metal fabrication.

Our Grey Iron Foundry, Structural and Machine Shops are at your disposal

for

Medium Heavy

SPECIAL MACHINERY

CONTRACT WORK SOLICITED

ROBT. HOLMES & BROS., INC.
JUNCTION AVE. DANVILLE, ILL.

PUNCHINGS
STAMPINGS
ASSEMBLIES

Quick action on your problem! Use our manufacturing facilities as your branch factory. Well-equipped for small and medium-sized work. Investigate time-saving possibilities *today!* Send prints or samples.

M & M MANUFACTURING CORP.
FORTVILLE, INDIANA

DESIGN & BUILD
JIGS, FIXTURES & GAGES

REED MACHINE & TOOL ENG.
BOX 662
PAWTUCKET, R. I.

METAL STAMPINGS
• TOOLS • DIES •
PERMANENT MAGNETS
HEAT TREATING
THOMAS & SKINNER
STEEL PRODUCTS CO.
1103 E. 23rd St. INDIANAPOLIS, IND.

MACHINISTS AND ENGINEERS
FIDELITY
MACHINE COMPANY
3908-18 Frankford Ave. Phila., Pa.
Jefferson 7600-1-2

DESIGNERS OF
Jigs, Fixtures & Dies
Prompt Service
LAWRENCE W. SECREST CO.
P. O. Box 265
Alexandria Virginia

WIRE AND METAL SPECIALTIES
In round, flat, square and special shaped wire in all metals.

LARGE PRODUCTION CAPACITY
Plating and finishing

EASTERN TOOL & MFG. CO.
BLOOMFIELD, N. J.

PATTERNS in WOOD and METAL
For All Kinds of Castings, Large or Small
MATCH PLATE WORK A SPECIALTY
Put your pattern problems up to us—we will take care of them—ask the foundries about our work —they use our patterns every day.

GENERAL PATTERN WORKS
2233 Buck Street Cincinnati, Ohio

QUALITY
SCREW MACHINE
PRODUCTS

• ● •

WALTHAM
SCREW COMPANY
WALTHAM • MASS.

YOUR SHORT CUT TO WAR SUB-CONTRACTS

American Machinist sends your advertising message to over 22,000 paid subscribers. These are the men who control over 90% of the buying power of Metal-Working. It is your "Open Sesame" to doors barring your way to profitable sub-contracts. *Try* the method that has worked for others! You will be pleasantly surprised at its low cost. For complete information at no obligation, write,

CONTRACT WORK DEPARTMENT

AMERICAN MACHINIST 330 W. 42nd St., NEW YORK, N. Y.

CONTRACT WORK

Advertisements on this and the preceding page are placed here by well-known concerns doing work on a contract basis. When you need assistance write to these established manufacturers.

COMMERCIAL HEAT TREATING

Seasoning of Steel, Nitriding
Centerless, Broach, Thread Grinding
Magnaflux & Optical Testing
Metallurgical & Chemical Laboratories

AGERSTRAND CORPORATION
Muskegon, Michigan

MACHINE SHOP

Facilities include 9" South Bend Bench Lathe, #2 Brown & Sharpe Milling Machine, Drill Press and 8"x8" Shaper. The usual line of hand tools and equipment plus experienced workmenship assure your satisfaction. Your inquiries invited.

C. VANDEGRIFT CO.
HOCKESSIN DELAWARE

MACHINE SHOP WANTS DEFENSE WORK

Lathes, Milling Machines, Drill Presses, Riveting, Hot Dip Tinning, Jigs and Fixtures. Investigate TODAY.

STEPHEN J. LEWIS ENGINEERING CO.
218 Butler St. Triangle 5-5348 Brooklyn, N. Y.

WORK WANTED FOR

Cylindrical Grinder 10"x54", Horizontal Boring Mill 2½" bar, Lathes, Milling Machines, Shapers, Drill Presses, Hand Screw Machines, Foot and Power Presses, Bench.

HAIDA ENGINEERING CO.
34-11 Vernon Blvd. Long Island City, N. Y.

Need steel balls

for defense assemblies ?

The Abbott Ball Company
1042 New Britain Ave., Hartford, Conn.

ABBOTT BEARING BALLS

KIRK & BLUM

WELDED MACHINE BASES, PEDESTALS and FRAMES
LATHE PANS
GEAR and BELT GUARDS
Pressed Steel Louver Panels and Cover Plates

THE KIRK & BLUM MFG. CO.
2823 Spring Grove Ave. Cincinnati, Ohio

SUBCONTRACTS WANTED

— Parts and Pieces — Complete Assemblies —

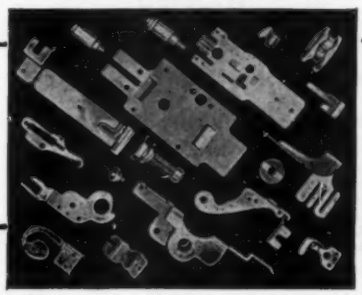
34 Automatic Screw Machines—Secondary Equipment: Milling, Drilling, Tapping, Threading—39 Punch Presses—Tool Room (well equipped)—Finishing: Parkerizing, Electroplating, Lacquering, Tumbling, Sand Blasting, Polishing, Buffing.

Write for Complete Facilities List

NATIONAL BRASS CO. GRAND RAPIDS MICHIGAN

STAMPINGS AND ASSEMBLIES

Fast Service on Long or Short Runs



"GREATER SAVINGS WITH GREIST"

We can handle your stamping and assembly requirements in any metal. Our modern equipment and methods coupled with 50 years of experience is your guarantee of accuracy and efficiency. Our facilities include capacity for handling screw machine products, tools, dies, jigs and fixtures.

Quality work by skilled mechanics is assured. Send your blueprints or samples today for prompt quotations!

THE GREIST MFG. CO.
546 BLAKE ST. NEW HAVEN, CONN.

MACHINES AND PARTS, SPECIAL TOOLS, ETC.

to your specifications

SPECIAL ENGINEERING WORK

. . . on Contract

It will pay you to investigate our facilities. As designers and builders of wire and ribbon stock forming machines we can offer you skilled and experienced assistance. Send us your blueprints or samples for prompt quotations.

We also solicit your bids for cam milling

THE A. H. NILSON MACHINE CO. Bridgeport, Conn.

THE NORLIPP COMPANY

Engineers . . . Manufacturers

Sub-contract facilities for die castings and metal stampings
556 West Congress Street Chicago, Illinois

GEST ENGINEERING & EQUIPMENT CO.

Ordnance and Defense Plant Equipment
Industrial Engineers
Jigs, Fixtures, Gages and Special Mach.
31 East, Georgia St. Indianapolis, Ind.

SEARCHLIGHT SECTION

EMPLOYMENT • BUSINESS • OPPORTUNITIES • EQUIPMENT—USED or RESALE

UNDISPLAYED RATE:

10 cents a word, minimum charge $2.00.
(See ¶ on Box Numbers.)
POSITIONS WANTED (full or part-time salaried employment only), ½ above rates.
PROPOSALS. 50 cents a line an insertion.

INFORMATION:

BOX NUMBERS in care of any of our New York, Chicago or San Francisco offices count 10 words additional in undisplayed ads.
DISCOUNT of 10% if full payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH

The advertising rate is $6.50 per inch for all advertising appearing on other than a contract basis. Contract rates quoted on request.
AN ADVERTISING INCH is measured ⅞ inch vertically on one column, 3 columns—30 inches—to a page. A.M.

NEW ADVERTISEMENTS received by 10 A.M., August 10th will appear in the issue of August 20th, subject to limitations of space available

---

WANTED

SUPERINTENDENT or FOREMAN

Somewhere there is an assistant superintendent or foreman of a machine shop who is progressive—knows how to handle men, and is efficient in the use of small precision tools.

This man can build for the future—help win the war—and make good money doing his part—in our factory.

Located in a city of 40,000 in the industrial area of Michigan, on a river, he will be in pleasant surroundings; a fine place to bring up his family.

Give your qualifications and send a picture, if possible, to our Advertising Agency. It's a real opportunity for the right man.

GUY CORE ADVERTISING AGENCY
REYNOLDS BUILDING
JACKSON, MICHIGAN

WANTED

Experienced man to take full charge of a Tool, Cutter and Gage Shop.

P-282, American Machinist
330 W. 42 St., New York City

WANTED

MACHINE TOOL DESIGNER

One of the finest equipped plants in the Metropolitan District requires a machine tool designer of the highest type; one who has proven ability in creative work and initiative. This is a rare opportunity for the right man. No letter considered that does not give complete details of background. Starting salary $10,000.

P-240, American Machinist
330 W. 42nd St., New York, N. Y.

$5200 per YEAR

For a first grade Machine Shop Foreman

Must have long experience with engine lathes, turret lathes, milling machines, automatic screw machines, hand screw machines. Ability to instruct and handle men essential. Full job security after wartime as we are continuing to manufacture our regular line for war needs. Well established firm located in New York City. Excellent living accommodations to be found near plant. Write stating qualifications, citizenship, etc.

P-290, American Machinist
330 W. 42nd St., New York City

WANTED

MACHINE TOOL DESIGNER

A machine tool plant located in Central New England requires a machine tool designer of the highest type, one who has proven ability in creative work and initiative. Position would lead to Chief Engineer to right party. No letter considered that does not give complete details of background.

EDGAR F. WILLIS
602 Statler Office Bldg. Boston, Mass.

WANTED

HIGH GRADE

MACHINE TOOL MAN

Must be thoroughly familiar with all types of machine tools and have proven sales and executive ability. Need not be a graduate engineer. Some travelling likely. Please give complete details in first letter. Permanent position at very substantial salary to right man. Please do not answer this advertisement unless you meet fully the requirements outlined.

P-293, American Machinist,
520 N. Michigan Ave., Chicago, Ill.

SUPERINTENDENT

WANTED

Chicago Manufacturer of Brass Fittings and Screw Machine products is looking for a working superintendent with a thorough knowledge of close precision machining of small parts on Brown & Sharpe automatics.
Must have a broad knowledge of 2nd operation machines, brass foundry work, able to estimate, make layouts, design cams and tools, and figure costs.
Fine salary with a good future.
We have been in business over thirty years and have an A-A-1 rating. Don't answer this ad unless you give a complete history of your experience, former employers, salary earned and your snapshot if possible.

P-292, American Machinist,
520 No. Michigan Ave., Chicago, Ill.

MANAGEMENT CONSULTING FIRM

is looking for products or companies which can be purchased for client in metal-working field.

B. O. 299, American Machinist,
330 West 42nd St., New York, N. Y.

POSITIONS VACANT

These Positions Vacant advertisements are published subject to agreement by the advertisers not to consider applicants now employed on war work unless they obtain written release from present employer.

WANTED SUPERINTENDENT. Thoroughly familiar with turret lathes, milling and drilling, medium size equipment. Defense work with excellent post war prospects with old established company for capable man. Write stating age, experience and qualifications. Reply P-270, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

TOOL DESIGNERS—Routers—Production Control Men. Must have machine shop background and complete knowledge of modern machine tools. Experience on medium-heavy machinery valuable. P-287, American Machinist, 330 W. 42nd St., New York, N. Y.

FORGING SUPERINTENDENT to take charge of new Forge and Die Shop with a Company located at Kenosha, Wisconsin. State age, experience, and qualifications. P-295, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

DIE MAKER that will qualify for Die Sinker of steel dies for War Production drop hammer tool products. Unusual opening for correct man with ability to eventually acquire position foreman of die department in plant of nationally known tool manufacturer to replace elderly man about to retire. Opportunity steady position good future. Address P-296, American Machinist, 520 N. Michigan Ave., Chicago, Ill.

TECHNICAL MAN with tool designing experience, capable of assuming complete direction of jobs from quotation up to production. Give full particulars. P-297, American Machinist, 330 W. 42nd St., New York, N. Y.

EMPLOYMENT SERVICE

SALARIED POSITIONS — $2,500 to $25,000. This advertising service of 32 years recognized standing negotiates for positions of calibre indicated. Procedure individualized to your personal requirements. Retaining fee protected by refund provision. Identity covered. If salary has been $2,500 or more send for details. R. W. Bixby, Inc. 266 Delward Bldg., Buffalo, N. Y.

POSITION WANTED

WORKS MANAGER or Superintendent, practical and technical with business experience. Experienced in supervising tooling and production on small and medium interchangeable parts. Address PW-298, American Machinist, 330 W. 42nd St., New York, N. Y.

PATENT ATTORNEYS

PATENTS—Booklet free. Highest references. Best results, Watson E. Coleman, Patent Lawyer, 724 Ninth Street, Washington, D. C.

PATENTS, COPYRIGHTS. Booklet. "General Information Concerning Inventions and Patents" and "Fee Schedule" sent without obligation. Established 1915. Lancaster, Allwine & Rommel, Suite 453, 815-15th St., N.W., Washington, D. C.

PATENT ATTORNEY, CONSULTING ENG'R, Over twenty years engineering experience with patents. Confidential, Personal Service. David Manly Heller, 134 North LaSalle, Chicago.

PROFESSIONAL SERVICES

MORRIS AND VAN WORMER
Est. 1924
Industrial Engineers
WAR PRODUCTION
METHODS — DESIGN — QUALITY
PLANT LAYOUT — CONVERSION
25 Broad Street New York City

SEARCHLIGHT SECTION

Newton Rotary Planer 24"
Arranged for Belted Motor Drive

Hendy Lathe 12" x 5'
Yoke Head. T.A.

16" G.E. Shaper B.G.

COOPER MACHINERY COMPANY
Youngstown, Ohio

AVAILABLE NOW

No. 32 Kempsmith Production Mill; power quick return on table.
10 x 36 Landis Cam Grinder; self-contained.
No. 53 National Acme Automatics; 4 spindle; tooling; good condition.
24 x 24 x 6' Cincinnati heavy-duty motor-driven planer; single head on rail.
No. 3 Mitts & Merrill Keyseater; 2" capacity; tooling.

A. R. MARSH MACHINERY CO.
4900 W. 73rd St. Cleveland, Ohio

ROLL LATHES

54"x20' Standard, Compound Geared Head for direct motor drive with piano and necking rests.
Limited service—Excellent condition.
42"x20' United Open Head, cone drive, with piano and necking rests. Good.

PLANER

36"x36"x12' Flather, 2-Heads on rail, power elevation, motor mounted on housing, 10 HP. 3/60/220 volts. Est. Wt. 12,000 lbs. Very good condition.

(All for immediate delivery.)

GALBREATH MACHINERY COMPANY
306 Empire Bldg. Pittsburgh, Pa.

Offer 60" x 72" x 27' Niles Lathe.
Also 34" x 18' Barrett Geared Head Pwr. Fd. to Tailstock.
36" x 18' Putnam Oil Geared Head, 18 Speed.

T. R. WIGGLESWORTH MACHINERY CO.
1721 Superior Cleveland, Ohio

26"x48"x27' Niles double spindle Lathe, internal face plate drive.
Niles 42"x42"x10' Planer, 3 heads.
#1½ Landis Internal Grinder.
2—#6 Fellows Gear Shapers.
Manville ¼"S. S., solid die Header.
5A High Speed Riveter, practically new.

JOHNSON MACHINERY EXCHANGE
61 Edison Place Newark, N. J.

FOR SALE

One 1½" Cleveland Model B Motorized
AUTOMATIC SHAFT MACHINE
Completely overhauled. Full set collets and tools, etc.
One ⅝" Cleveland Model A
AUTOMATIC SCREW MACHINE
OR
Will exchange for 2"
Cleveland Model A
AUTOMATIC SCREW MACHINE

G. & M. SCREW PRODUCTS CO.
Tel. RAvenswood 8-0088
4-28 Astoria Blvd., Long Island City, N. Y.

IF YOU ARE DOING DEFENSE WORK

Send for Our Latest Circular Covering Bargains in Small Tools Such as Drills, Reamers, Turret Attachments, etc.

DEWITT TOOL COMPANY
173 Grand St. New York City

W A N T E D

Small Business • *Steel Fabrication Shop* • *New Inventions* • *Equipment*

WANTED AT ONCE

SMALL or MEDIUM SIZE STEEL FABRICATING SHOP

Will pay cash for machinery and equipment usual to a small or medium size steel fabricating shop. Need shears, punches, etc. Top price. Write or wire P.O. Box 116, Edgewood Station, Cranston, Rhode Island.

WILL BUY SMALL MANUFACTURING BUSINESS

Established Central New York manufacturer interested in buying small manufacturing business involving 25 to 200 employees which is now or was recently engaged in producing peacetime products or having small outlet for defense purposes. Possibly a business seriously handicapped because of material priorities which cannot operate profitably as a separate unit.

Principally interested in product of metal construction using standard machine tools such as lathes, turrets, millers, grinders, etc., in its manufacture. Nationally known units applying to automobiles, tractors, other transportation vehicles or certain types of industrial plant equipment and household appliances most desirable.

Write in detail giving size of plant, number of workers usually employed, description of product, etc. Replies treated as strictly confidential.

BO-294, American Machinist
330 W. 42nd St., New York City

WANTED

Fitchburg Lo-Swing Lathe 8" Swing 60" Centers preferred

MOTOR SALES & SERVICE COMPANY
461 Brunswick Avenue
Trenton, N. J.

WANTED

Long Bed Lathes up to 24" x 24'
State Condition

W-291, American Machinist,
330 W. 42nd St., New York City

NEW INVENTIONS WANTED

Mechanical and electrical devices which can be used to promote our war production program. Either new ideas, or improvements upon present methods.

P. O. Box 217, Denville, N. J.

KEEP 'EM RUNNING!

REBUILT AND READY to SHIP

1—20" SELLERS slotter M.D. with 3/60/220 V motor.

1—4" BIGNALL - KEELER pipe machine, M.D. with 3/60/440 V motor

1—24" INGERSOLL cutter grinder, M.D. with 3/60/440 V motor

1—No. 1 MANVILLE cold header, single pulley drive

1—No. 1 CAMPBELL nibbling machine, M.D. with 3/60/220 V motor

ALSO AVAILABLE

9 & 10 NILES-BEMENT-POND H.D. vert. Millers
2 SLOAN & CHASE Universal Precision Bench Miller
30" x 30" x 10' NEWTON Horiz. Slab Millers
24" GOULD-EBERHARDT Gear Cutter
#3-H BROWN-SHARPE Automatic Gear Cutters
#4—36" BROWN-SHARPE Gear Cutter
50" x 8" GOULD-EBERHARDT Spur & Bevel Gear Cutter
#5—60" BROWN-SHARPE Gear Cutter
64" x 20" G & E Spur Gear Cutter with Internal Attm't
90" PRATT - WHITNEY Spur & Worm Gear Cutter
22" RHENANIA Hobber
15" GLEASON Bevel Gear Generator
24" GLEASON Bevel Gear Planer

ALL MOTOR DRIVEN

SIMMONS ENGINEERED Machine Tool REBUILDING

SIMMONS MACHINE TOOL CORP.
1759 North Broadway, Albany, N. Y.
N. Y. Office: 149 Broadway

USED MACHINE TOOLS
GUARANTEED BY
A TIME TESTED, RELIABLE COMPANY

BROACHES
No. 4 J. N. LaPointe

DRILLS
1 spdl. Henry & Wright
1 spdl. Leland-Gifford
2 spdl. Leland-Gifford Bench
2 spdl. Henry & Wright
4 spdl. Henry & Wright
4 spdl. Sigourney
4 spdl. Woodward & Rogers
6 spdl. Henry & Wright
2 spdl. Baker Cylinder Borer

GEAR CUTTERS
No. 4—48" Brown & Sharpe

GRINDERS
(See page 181—special advertisement Hill-Clarke Cylindrical Grinders)
22"x96" Norton Plain, M.D.
No. 40 Bryant Plunge Cut, Wide Wheel, Oscillating
No. 10 Lees-Bradner Spur Gear Grinder
No. 18 Bryant Internal
No. 60 Heald Cylinder
1½" dia. New Yankee Drill Grinder

LATHES
3½"x60" Fitchburg Lo-Swing
No. 4 AC Leblond Auto. Duplex Crankshaft

SLOTTERS
10" Newton

MISCELLANEOUS
60" Quickwork Rotary Shear
6" Saunders Pipe Machine
12" Bignall & Keeler Pipe Machine
No. 4 Gaterman Tapper, 5/16" Cap.

HILL-CLARKE MACHINERY CO.
651 W. WASHINGTON BLVD. CHICAGO

Reconstruction Machine Tool Corp.
Rebuilding Plant
424-432 Bryant Ave., Bronx, N. Y.
Dayton 3-4246

We are equipped to
REBUILD
and
MODERNIZE
your old tools for today's tasks.

Send us full details of your problems—we will be glad to have one of our engineers inspect your machines and submit a quotation—without obligation on your part.

WRITE — WIRE — PHONE

GRINDERS
12x36 Pratt & Whitney, Surface
6x32 Norton
2—Heald #60
2—Bryant #15
Brown & Sharpe #11
Modern, 10x18
8x30 Landis, Plain, m.d.
#3 Bryant
#2 Oakley, Tool & Cutter
#2 Cincinnati, Tool & Cutter

THE O'BRIEN MACHINERY CO.
OFFICE: 113 NORTH THIRD STREET
PHILADELPHIA, PA.

144 INCH GLEASON STRAIGHT BEVEL GEAR PLANER

CAPACITY: Spur Gears to 144" Dia. x 16" Face, Bevel Gears to 100" Dia. x 16" Face

Motor Driven with 220 Volt, D.C. 1000 to 1800 R.P.M. Motor. With Standard Equipment and Large Assortment of Cutting Tools.

INDIANAPOLIS MACHINERY & SUPPLY CO.
INCORPORATED
1959-69 S. Meridian St., Indianapolis, Ind.

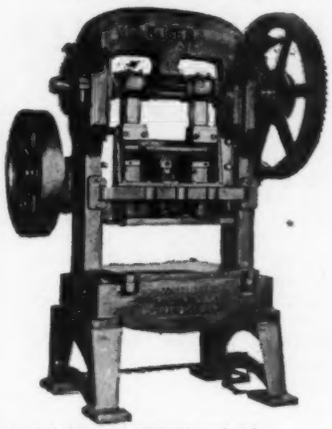
SLIDING-BED GAP LATHE

18"/36"x12' NEW HAVEN Quick Change, 3-step cone, DBG; takes 11'6" between centers with gap open; with 2 chucks, taper attachment, etc.

ALEX ZEEVE & COMPANY
2269 Woolworth Building New York, N. Y.

FALK for DEPENDABILITY

PUNCH PRESSES



No. 18, 18C, 19, 19C, 20B Bliss, O.B.I.
No. 19 Truesdale OBI.
No. 4 Adriance OBI.
No. 46 MICHIGAN OBI
No. 4 V & O—OBI.
No. 73½ BLISS S.S. Plain flywheel.
No. 4 Bliss Back Flywheel Geared.
No. 2 BLISS Back Flywheel Plain, (6).
No. 1—Bliss Back Flywheel Plain.
No. 3R—Marquette Geared, Motor Dr.
No. 15N BLISS, arr. Geared, Motor dr. (2).
No. 41 TOLEDO HORN PRESS, arr. Motor dr.
No. 6 Waterbury Backed Geared, Open Back.
No. 25N BLISS Geared, Motor dr.; (3).
No. 1 BLISS S.S. Toggle Press.
25 Ton Henry & Wright High Speed Press, dble. roll
No. 103S BLISS GANG DIE PRESS; Roll Feed.
No. 4½ BLISS three column Forging Press with Taper
6 Ton General Flexible Press.
12 Ton Fox Flexible Press.
400 lb. Chambersburg board Drop Hammer.
1500 lb. Chambersburg Steam Hammer, single leg.
50 lb. DuPont Blacksmith Hammer.
15 lb. Bradley upright Strap Hammer.
No. 30 BLISS ARCH PRESS, Plain.
No. 25 NIAGARA ARCH PRESS, Plain.
No. 71 Waterbury Coining Press 25 Tons.
No. 93D TOLEDO DBLE. CRANK GEARED S.S. PRESS, Welded Frame.
No. 75 Toledo Open Back Plain Flywheel Press.
No. 16 Bliss Horn Press, 3" stroke, Motor Driven.
No. 2 Niagara OBI; No. 0 V & O (3).
No. 3 American Can Co. OBI.
No. 53 Perkins Sprue Cutter.
No. 5 Middleditch Sprue Cutter.
No. 1—100 lb. Standard Automatic Drop Hammer.
No. 702—BLISS TRIMMING PRESSES (2) Flat.
No. 4 Waterbury open back, rigid bed, plain.
520 Ton Southwark Hydraulic with Laurie Pump.
SHERIDAN EMBOSSING PRESS, 24x36.
#7H Cleveland HORN PRESS back geared, 8" stroke with screw elevating cable. 42 tons.
#39B Bliss HORN PRESS.
#4 Bliss, double crank GEARED PRESS. 4" stroke, bed 32x28.

SHAPERS & SLOTTERS

15" HENDEY, Friction Drive (5), $450 ea.
20" CINCINNATI, Geared Crank, complete.
24" Stockbridge, Geared, Crank, Heavy. Cone dr.
20"x20"x24" N-B-P SHAPER-PLANER, Motor Dr.
12" New Haven Slotter; 32" Rotary Table.
7" Rhodes combination Shaper and Slotter, belt dr.

DRILL PRESSES—HIGH SPEED, BALL BEARING; SLIDING HEAD; SCREW EL. TABLES

4-Spindle Foot-Burt High Speed Ball Bearing with power feed to each spindle; automatic quick return, tight and loose pulley drive; 8" overhand No. 2 Morse Taper; table working surf. 14"x48".
1-Spindle Avey No. 3, 12" Overhang, No. 3 M.T. with Power feed; Ball Bearing.
1-Spindle Avey No. 2, 8" Overhang, No. 2 M.T. with Power Feed; Ball Bearing.
2-Spindle Avey No. 2, 8" overhang, No. 2 M.T. Plain Hand Feed; Ball Bearing.
3-Spindle Avey No. 2, 8" Overhang, No. 2 M.T. Plain Hand Feed; Ball Bearing.
2-Spindle Leland Gifford No. 2 M.T. 10" Overhang. Power feed to one Spindle.
2-Spindle KERN No. 2 M.T. 8" Overhang.
2-Sp. Henry & Wright, 8" Overhang, No. 2 M.T.
1-Sp. EDLUND No. 2B, 8" Overhang, No. 2 M.T.
1-SPINDLE ALLEN No. 2 M.T. 8" Overhang.
1-Spindle FOSDICK with TAPPING MECHANISM On SPINDLE No. 2 M.T. 8" Overhang.

DISC GRINDERS

Gardner No. 8—40" disc, 30" Ring Wheel, B.B. Belt Dr.
Gardner No. 4—20" Disc., 16" Ring Wheel, B.B. Belt Dr.
Badger No. 2—16" Disc, Double End, Univ. Tables, Belt.
Gardner No. 1—double end Disc, 12", B.B. belt dr.
GARDNER No. 14, Ball Bearing, double opposed, 20" discs.

20"x120" Landis Plain Cylindrical Grinder Self Cont'd, Motor drive, Serial 8034.

GRINDERS—Cylindrical

20"x120" LANDIS Self-Contained, Motor dr.
12x36" CINCINNATI Plain, Arr. Motor Dr.

AUTOMATIC CHUCKING MACHINES

2—No. 24 New Britain type 5 spindle.
1—No. 23 New Britain type 5 spindle.
1—J&L HARTNESS AUTOMATIC CHUCKING LATHE; motor driven, 6"x12".

BROACHING MACHINE

Cincinnati SURFACE BROACHING MACHINE, model #5-54 duplex. New in 1937.

PUNCH & SHEARS

WICKES COMBINATION PUNCH AND SHEAR; MOTOR DRIVEN; 1¼" thru 1" Plate; Punching end 48" throat; Shearing end 36" throat; Continuous 6"x1" Plate.
LONG & ALLSTATER No. 2—24" Throat, arr. motor dr. Capacity 1" thru 1".
Niagara 36" foot Shear, 16 ga.
Kutscheid all steel 36"x16 ga. Foot Shear.
Pexto 48"x16 gt. Foot Shear.
Pittsburgh 36"x⅜" Plate Shear, no holddown.
UNITED ENGINEERING Plate Shear 42"x3/16 no holddown.
No. 216D NIAGARA RING AND CIRCLE SHEAR, Motor Dr.
No. 236 PEXTO CIRCLE SHEAR, SPD; 16 ga.
No. 132 BLISS 14 ga., 12" throat, Slitter.
No. 232 Bliss 12 ga., 18" throat, Slitter.
12'x¾" and 6'x¾" STAMCO MILL PACK SHEAR.
BLISS 24"x16 ga. POWER SHEAR—Perfect for Tin Plate.

COILING MACHINES

No. 1 and No. 2 SLEEPER & HARTLEY BX CABLE COILING MACHINES ⅜ and ½" cap. Last used for Speedometer cable. Complete.

KEY SEATER

No. 3⅛ BAKER 72"x3" Cap. immediate delivery.

HAND SCREW MACHINE

#2 BARDONS & OLIVER, Geared Friction Head. Power feed to Turret. 1" Cap. fitted with complete automatic chuck and air cylinder.

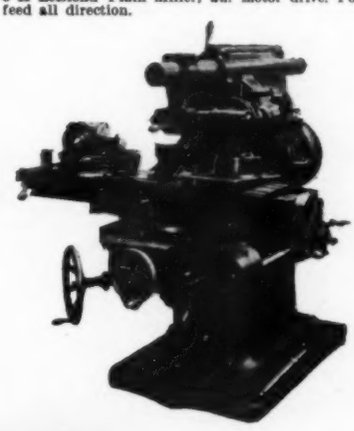
INTERNAL GRINDER

GREENFIELD No. 12, HYDRAULIC FEED, Motor Drive; Cap. swings 15" Grinds automatically ¾" to 5" dia.; 4" Deep; New in 1928.

MILLING MACHINES

No. 1 Cleveland, Motor Drive—$1,750.00. Coolant Pump, Motor $95.00 Extra. cap. 18" longit. feed 16" Vertical travel 8½" cross travel table working surface 8"x32"

No. 12 Pratt & Whitney Lincoln Production Miller.
No. 2 Pratt & Whitney Lincoln Production Mill.
1—3-H LeBlond Plain Miller, au. motor drive. Power feed all direction.

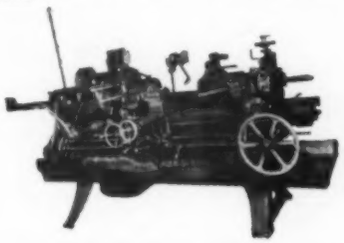


LATHES

42"x25' PUTNAM triple geared, 17'6" centers; Plain change gear, screw cutting.
36"x18' PRENTICE Lathe 9' Centers—Pl. chge. screw cutting, chuck and standard equipment.
22"x16' REED light Pattern, Pl. Change gear; 11" Centers, $750.
19x8 LEBLOND Production Turning Lathe
1—16"x8' American C.G. Lathe—au. M.D.
11"x4½' DAVIS pl. change screw cutting engine lathe; complete; $225.
10"x4' LOGAN (NEW) Lathes, Ball Bearing Spindle; ⅛" Collet capacity; arranged for motor drive; power cross feed; $225, f.o.b. factory; priority certificate required; shipment from stock.
7"x36" PRECISION BENCH LATHES — Hardings, Sloan & Chase and others.
8"x108" FITCHBURG LO-SWING LATHE; SPD.
18"x12' HAMILTON pl. Change, Cone dr. chuck
11"x4' PRATT & WHITNEY TOOLMAKERS LATHE, Taper att.
16"x6' SOUTH BEND pl. Chge., Screw Cutting Engine Lathes (2).

TURRET LATHE

JONES & LAMSON 3x36 Double Spindle Very fine condition.



5" Bar BETTS Knee Type Horizontal Boring Mill, M.D.

COLD HEADERS
#22 Waterbury Farrell Cold Headers Dble stroke Solid Die also #11.

RADIAL DRILLS

DRESES 3' Arm. Plain Radial, Motorized; REBUILT —READY TO GO.
DRESES 4' Arm, Plain Radial, cone dr.

DIE CASTING MACHINES
3—MADISON-KIPP late model, 10"x12", 12"x14", 12"x16".

GEAR CUTTERS

No. 2 WHITON SPUR GEAR CUTTER, Auto.
36" Gould & Eberhart, "Victoria Model" perfect Cond.
48" Gould & EBERHART, Motor Driven; Complete; Perfect Cond.
No. 36B Gould & Eberhart Spur and Bevel Gear Cutter, Motor Dr.

HAMMOND 10 H.P. BUFFERS—8 months old. Motors in base, 3-60-220/440.

NEW LINES—WE SELL DREIS & KRUMP "CHICAGO" PRESS BRAKES AND BENDING BRAKES; STREINE POWER SQUARING SHEARS; BUFFALO DRILLS AND IRON WORKERS; CLEVELAND MILLING MACHINES; INDEX UNIVERSAL VERTICAL MILLERS; TROYKE ROTARY TABLES; L-W LATHE CHUCKS; INDEX HEADS; MAGNETIC CHUCKS AND HACK SAWS; VISES; OSWEGO MACHINISTS BENCH VISES; B-LINE MOTORS; VALLEY ELECTRIC GRINDERS; INQUIRIES INVITED.

FALK MACHINERY COMPANY

MACHINERY MERCHANTS

18 WARD ST., ROCHESTER, N.Y.

EASTERN OFFERS

MILLING MACHINES

No. 1B Brown & Sharpe Plain, s.p.d.
No. 2B Milwaukee Plain Double Overarm
No. 2 Knight, s.p.d.
No. 1½ Cincinnati Plain, cone
No. 5 Becker Vertical
Gooley & Edlund Briggs Type
Pratt & Whitney Lincoln Type
6x14" Pratt & Whitney Thread
36"x36"x14' Bement Slab, m.d.
40" Ohio Tilted Rotary, m.d.

SHAPERS

20" Steptoe
24" Ohio
32" Morton Railroad Type Draw Cut, m.d.

TURRET LATHES AND SCREW MACHINES

No. 0 Brown & Sharpe Hand, cone
2¼x24" Jones & Lamson Geared Head, bar
3x36" Jones & Lamson, bar
3x36" Jones & Lamson, chucking (4)
2 spindle 3x36" Jones & Lamson, chucking (4)
Woods Tilted Turret, cone

AUTOMATICS

No. 33 New Britain, m.d.
⅝—1½" Cleveland Model B, m.d.
⅞" Cleveland Model A
4 spindle ⅞" Cleveland Model M, m.d.
1¼" Cleveland Model C
1¼—1½" Cleveland Model B
No. 6D Potter & Johnston Automatic for brake drum work

PLANERS

26"x26"x8' Niles, 1 head
48"x48"x10' Putnam, 3 heads

AIR COMPRESSORS

Usaco, m.d., 25 cu. ft.
6x6" Curtis Twin Cylinder
7x7" Curtis Twin Cylinder
Air Hoists

ARBOR PRESSES

No. 24 Greenerd Power, m.d.
15 ton Lucas High Pattern, 60" height
15 ton Lucas High Pattern, 72" height

BOLT THREADING MACHINES

9/16" Landis 2 spindle, m.d.
1" Acme 2 spindle, belt
1" Acme 3 spindle, belt
1" Landis, belt
2" Landis, belt
2½" Acme, belt
No. 11-8 Rickert-Shafer Auto. Threading Machine, m.d., 1" cap.
American Bolt Heading Machine, 1¼" cap.

BORING MILLS

24" Bullard New Era, m.d., side head
30" Colburn, 1 rail head, m.d.
42" Niles-Bement-Pond Car Wheel Borer, belt
48" Niles-Bement-Pond Car Wheel Borer, belt

BROACHING MACHINES

Cincinnati Mill Broach, m.d., new
No. 1, 2 J. N. LaPointe, belt
No. 2 LaPointe of Hudson, belt
No. 2 J. N. LaPointe, m.d.
No. 3 J. N. LaPointe Double, belt

BALL BEARING DRILLS

Mason Bench Type (3)
Sigourney Bench Type (2)
Henry & Wright Class K, No. 2
Avey No. 2
3 spindle Bar No. 1
4 spindle Fosdick, ⅝" cap.
4 spindle Fosdick, No. 2 taper, p.f.
4 spindle Gardam No. 1
4 spindle Henry & Wright No. 2
4 spindle Kokomo
6 spindle Henry & Wright No. 2

MULTIPLE SPINDLE DRILLS

5 spindle Barnes All Geared-Self-Oiling
No. 008 Garvin Duplex
No. 1 Pratt & Whitney 2 spindle Gun Barrel
D2 Fox Multiple Straight Line
No. 2, 3 Baush
No. 7D Moline 2 spindle Hole Hog
D11, 15HC, 26C Fox
No. 37 Natco

Many other machines in stock. Send us your inquiries.

The EASTERN MACHINERY CO.
1004 TENNESSEE AVE.
CINCINNATI, OHIO

...IN STOCK

AUTOMATICS

No. 515 National Acme, four spindle
No. 52 National Acme, four spindle
No. 53 National Acme, four spindle
No. 55 National Acme, four spindle
⅞" Gridley, Model G, four spindle
1¾" Gridley Model F, four spindle
1¼" Cleveland Model A, single spindle
2½" Cleveland Model A, single spindle

BROACHES

No. XB10 Oilgear Hydraulic Twin Spindle
15 Ton Hercules Vertical

DRILLS

4' Prentice Radial
No. 17 Foote Burt, 2 spindle
No. 1 Bausch, 8 spindle
Pratt & Whitney Gun Barrel, 2 spindle, m.d.

GEAR CUTTERS

No 3 Brown & Sharpe Automatic Gear Cutter
No. 3 Spindle Gould & Eberhardt Gear Rougher
No. 6 Fellows Gear Shaper
144" Gleason Gear Planer
15" Gleason Spiral Bevel Generator
18" Gleason Gear Tester
No. 5A Lees-Bradner Gear Generator
10. 10 Lees-Bradner Gear Grinder
30" Rochester Gear Tooth Rounder

GRINDERS

10"x20" Landis Cylindrical, hydraulic
12"x42" Landis Cylindrical
No. 55 Heald Cylinder
No. 60 Heald Cylinder
No. 24-53" Gardner Disc

LATHES

17" x 8' Sidney, c.d.
18"x6' Lodge & Shipley, c.d.
26"x14' Niles Bement Pond, c.d.
17"x8' Wickes Porduction, c.d.
3½"x60' Fitchburg Lo-Swing, g.h.

TURRET LATHES

No. 6A Potter & Johnston, g.h.
No. 3 Foster, g.h., timken bearing
2¼"x11" Acme, c.d.
2¼x24 Jones & Lamson, g.h.
3x36 Jones & Lamson, g.h.

MILLS, PLAIN

No. 3 Cincinnati, c.d.
No. 8 S Becker, Duplex, c.d.

MISCELLANEOUS

No. 3E Lees-Bradner Thread Miller, Collet Type
⅜"x6' Pyramid Type Roll
⅝"x18' Nilson Wire Straighener
Wicaco Oil Groover
2" Pratt & Whitney Duplex Spline Mill

TAPPERS

No. 1 Garvin
½" Rickert Shafer Radial

INDIANAPOLIS MACHINERY & SUPPLY CO., INC.
1959-69 South Meridian Street
INDIANAPOLIS, INDIANA

Eastern Branch:
44 WHITEHALL STREET, NEW YORK, N. Y.

MOREY
DEPENDABLE
USED MACHINES

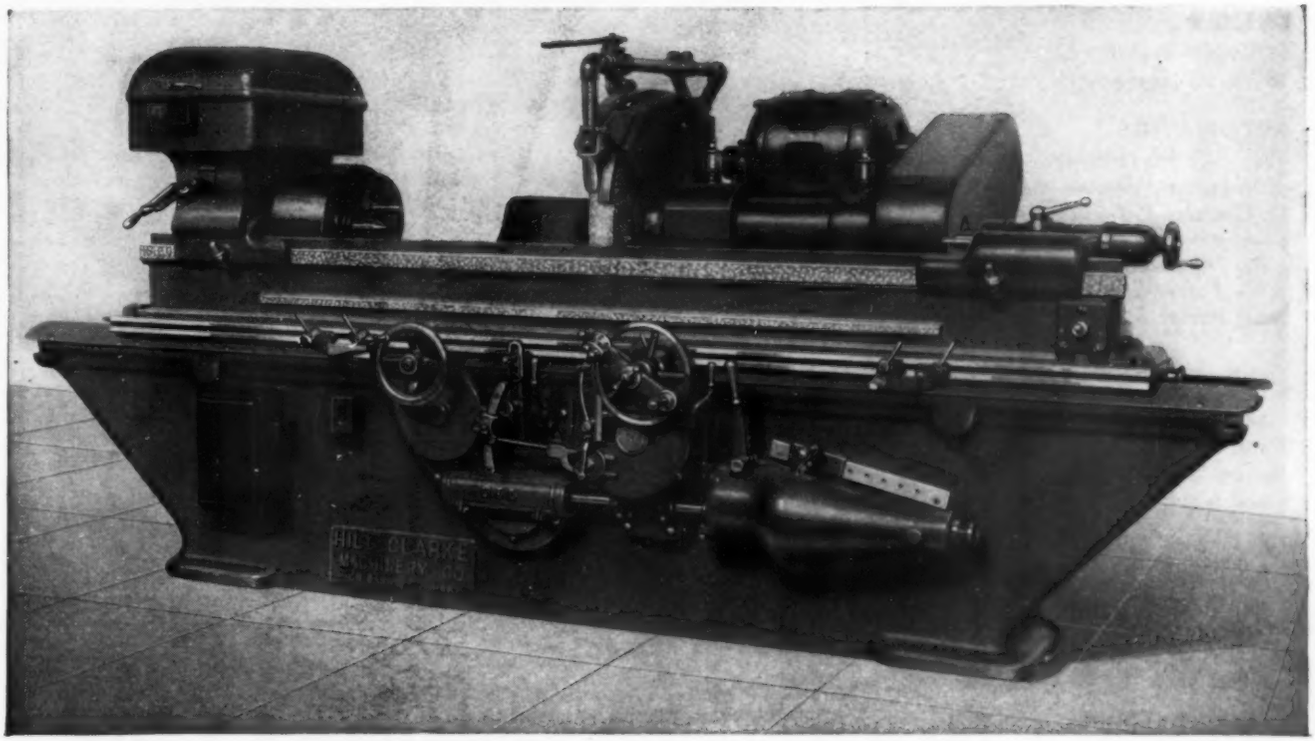
LA POINTE No. 2 two spindle Broach—M.D.
ROCKFORD #2 Horiz. Boring Mill —floor type—M.D.
G. & E. 48" Gear Cutter
WHITON No. 15 Auto. Gear Cutter
INGLE 12" Gear Tooth Rounders
GLEASON 37" Bevel Gear Planer
GLEASON 10" Spiral Bevel Gear Generator
GLEASON 6"-11"-18" Bevel Gear Generators
LEES BRADNER #5A Gear Generator
LANDIS 3½" Internal Hydraulic Race Grinder
LANDIS 16"x36" Plain Cyl. Grinder—M.D.
NORTON 14"x50" Plain Grinder —M.D.
HEALD No. 60 Internal Grinder
NORTON 16"x50" Crankshaft Grinder—M.D.
GARDNER No. 6 Dble. End BB Disc Grinder
P. & W. 6"x132" Thread Miller
FELLOWS No. 4T Thread Generator
AUTOMATIC MACHINE CO. 12x4' Threading Lathe
BRIDGEFORD 27"x10' Boring Lathe
MONARCH 16"x10' Geared Head Lathe
FOOTE BURT No. 3 Rail Drill
P. & W. No. 12 Multi-Spindle Drill
NATCO C-13 Hyd. Multiple Spindle Drill
NATCO C-11C Multiple Spindle Drill
BLISS No. 31 Power Press
ESPEN LUCAS No. 138 Cold Saw —Cap. 12" Rd.
NEWTON No. 197 & No. 200 Cold Saws
COCHRANE & BLY No. 5 Cold Saw
COULTER 2 spindle Diamond Borer—M.D.
LANDIS 4" Single Head Bolt Cutter
ACME 1" All Steel Upsetter
AJAX 3" All Steel Upsetter
SAUNDERS 8"-18" Pipe Threader
TREADWELL 12" Pipe Machine
KELLER E3 Auto. Profiler (Die Sinker)
GISHOLT Precision Balancing Machine

THIS IS A PARTIAL LIST

• *Write us* •
your Specific Inquiries

MOREY MACHINERY CO., Inc.
415 BROOME ST. NEW YORK

Yours for Super Grinding!



HILL-CLARKE CYLINDRICAL GRINDERS

give you a finish within a few micro-inches even when using standard grain free-cutting wheels. Contributing to this achievement is a patented multiple V-belt drive from a constant speed motor to the work spindle.

Throughout the machines there are refinements in design, fitting of components, minimized vibration which make possible extreme accuracy in all grinding operations. An accurately fitted wheel slide with cross feed screw mounted in ball bearings provides sensitive wheel control essential to duplicate work within close limits. For complete information, write for our illustrated catalog "Super Grinding."

SIZES			
10 x 36	10 x 72	14 x 50	16 x 72
10 x 50	14 x 36	14 x 72	18-30 x 96

HILL-CLARKE MACHINERY CO.

651 WASHINGTON BOULEVARD, CHICAGO

MODERN TOOLS

Immediate Delivery

LATHES
38" x 18' Prentice G. H.
18" x 10' Prentice G. H.

AUTOMATICS
2¼, 3¼, 4¼ Gridley
#55 National Acme M.D.
2" Cleveland
2—4 spindle New Britain Chucking Machines
#5A Potter & Johnson
#6A Potter & Johnson
2¼" x 24" J. & L.
Model G ⅞" Capacity Gridley
2—Cleveland 4 spindle ⅞ Model M, M.D.
0 and 00, B. & S.
25 Ton Bedford Crane
4 and 6 spindle Allen Drill Presses

GEAR CUTTERS
36" Fellow
#26 Brown & Sharpe
#3 Newark Spur
18" Gould & Eberhardt Spur & Bevel

RADIAL DRILLS
6' Prentice Gear Box, M.D.

VERTICAL MILLERS
#5B Becker

SHAPERS
14" Chase
16 and 20" Steptoe
24" Gould & Eberhardt

BORING MILLS
36" Niles
30" Niles

GRINDERS
12 x 72 Brown & Sharpe
12 x 24 Cincinnati Universal

MISCELLANEOUS

Slotters
14"-16" Newton Vertical

Forming Rolls
Heavy Duty 5 Sets & 3 Sets

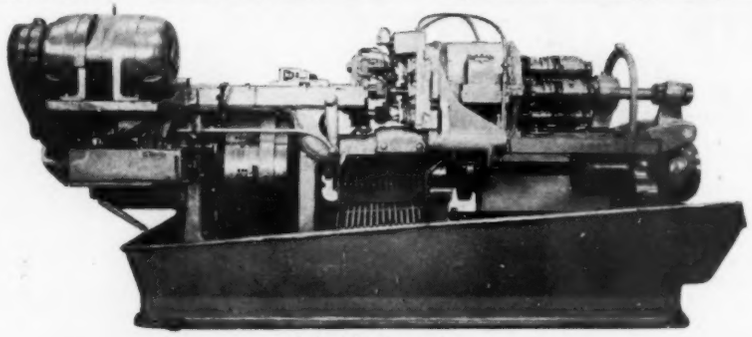
1—Chambersburg steam or air hammer 1000 lbs.
1—4 x 4½ Oaking punch & shear
1—40 lb. Bradley Hammer
1—Lees Braddner Thread Miller

This is only a partial list

S. & S. MACHINERY CO.
207 CENTRE STREET
NEW YORK, N. Y.
CAnal 6-2724

Now Available—

NEW BRITAIN CUTOFF MACHINE



Actual Photograph

Capacity of chuck: 1⅝" round, 1.149" square, 1.407" hexagon. Length of feed 7".

Arranged for motor drive with 10 H.P. motor. Weight approximately 10,400 lbs.

A high speed cutoff machine that can be used for forming and cutting off. It can be readily set up for use on small lot production.

Your inspection is solicited

LOUIS E. EMERMAN & CO.
1761 Elston Ave. Chicago, Ill.

OTT MACHINERY SPECIALS

AUTOMATICS, Cleveland, 1¼, 2 & 3¾, Model A
AUTOMATICS, Cleveland, 4¾" 4 spdle Chucker
AUTOMATICS, Cleveland, ⅞" 4 spdle. Model M
AUTOMATICS, Cleveland, ⅞ & 1½" Model B, M. D.
AUTOMATICS, #22, 23 & 24 New Britain
GRINDERS, Landis 10x36" Hydraulic, M.D.
MILLING MACHINE, Lees-Bradner #3 Thread
PLANERS, Bedford & Patch, 36"x13' Open Side with 1 Rail & 1 Side Head
PRESSES, Toledo, #34 Solid Back, S.G.
PRESSES, Toledo #2 to 6 Open Back Inclinable
PRESSES, Ferracute, P2, 3 & 4, Solid Back

OTT MACHINERY SALES, INC.
542 Second Ave. Detroit, Mich.

AUTOMATICS, 1¼" Cleveland Model B; #34 New Britain Chucker
GRINDERS, #2 Churchill Internal, can grind 30" deep, dist. center of spin, to top of table 18"; 30" x 240" Landis Cyl.; 24" x 96" Landis Cyl.; 20" x 96" Landis Cyl.; No. 25A Heald, 30" Rotary Surface, M.D.
GEAR CUTTERS—84" & 60" Gould & Eberhardt, Spur (2); 11" & 6" Gleason Bevel Gear Generators (4); 36" G & E Spur and Bevel. 48" & 36" Cinci spur (2);
KEYSEATERS—#3 Baker, 26" stroke x 3" wide; #6 Catlin 40" stroke x 5" wide; #4 Mitts & M.
MILLING MACHINES—#3 Lees Bradner Thread Miller; #3 P & W die sinker; #6 Jackson Die Sinker or Vertical Miller.
PLANERS—72" x 60" x 14' Cincinnati, 3 hds. D.C. reversing M.D. 60"x48"x14' Bertram Openside, 3 hds., DC Reversing M.D.; 26" x 8' Gray, 1 head.

ROSENKRANZ MACHINERY CO.
30 Church Street New York, N. Y.

1—No. 5 Brown & Sharpe Vertical Mill, M.D.
1—No. 21 Brown & Sharpe Automatic Mill
1—No. 72 Heald Internal Grinder, M.D.
1—Wagner Cold Saw
1—12" Cincinnati Production Mill, M.D.
1—No. 2X Hannifin Air Arbor Press
1—Kingsbury 8 Head Multiple Drill, M.D.
1—Binnel Tester
1—No. 2 Baxendale Punch Press, M.D.
1—No. 62 Bliss Punch Press, M.D.
1—Dings Magnetic Separator
1—No. 1-A Wm. Sellers Universal Tool Grinder

Your Inquiries Receive Prompt Attention.

Central Machine Tool Corporation
122-126 Nebraska Ave. Toledo, Ohio

BEDFORD 42" x 42" x 14' OPEN SIDE PLANER
1 cross head, 1 side head.

AARON MACHINERY CO.
45 CROSBY STREET NEW YORK, N.Y.

QUICK DELIVERY

37" Gleason Bevel Gear Planer

J. L. LUCAS & SON, INC.
BRIDGEPORT CONNECTICUT

ST. LOUIS' Headquarters FOR GOOD USED TOOLS, OFFERS:

ROCKFORD 24" S.P.D. Shaper
BULLARD 51" Vert. Boring Mill
MUELLER 4½' Gear Box Drive Radial Drill
PUTNAM 27"x14' Q.C.G. Lathe
BRIDGEPORT 32"x18' GHD. HD. Lathe
BECKER #25 Pl. Miller
NILES 12" Vert. Slotter
INGERSOLL 2—SP. Vert. Miller
B&S 48"x10" #4 Gear Cutter
FELLOWS #3 Gear Shaper
GOULD & EBERHARDT Rotary Milling Mach.

Write Us For Any Other Tools You May Want
Let Us Quote On All Machinery Needs

McDONALD MACHINERY CO.
1531-35 N. Broadway St. Louis, Mo.

SELLERS 36"x36"x9' Planer—4 heads.
POWELL 36"x36"x8' Planer.
PRATT & WHITNEY No. 12 Prod. Millers.
DRAPER 27"x16' Screw Cutting Lathe G.F.P.D.
NATIONAL 40"x18' Screw Cutting Engine Lathe G.F.P.D.
NEWTON 14" Vertical Slitter.
OHL 10' Shears and Press Brake.
YODER Roll Formers.

NATIONAL MACHINERY EXCHANGE
130-136 Mott Street New York, N. Y.

POWER PRESSES
BLISS, TOLEDO, V & O, ETC.
REBUILT — GUARANTEED
JOSEPH HYMAN & SONS
Tioga, Livingston and Almond Streets
Philadelphia, Pa.

GOOD USED MACHINERY

AIR COMPRESSORS

136', 8"x8" **Chicago Pneumatic Tool Co.**, type NSB.
136' 8"x8" **Ingersoll Rand**, type ERI.
550', **National** 3-cylinder vertical
620', 14"x8¾"x10" **Sullivan**, class WJ3 angle compound
706' 17"x9¾"x12" **Sullivan**, class WJ3 angle compound
868' 17"x10"x12" **Chicago Pneumatic Tool Co.**, type OCB
1400', 20"x12"x14" **Sullivan**, class WJB

BULL DOZERS

Nos. 5, 6 and 29 **Williams & White**

BROACHES

No. 1 **LaPointe**, screw type
No. 2 **Standard** screw type broaching press
No. 3 **LaPointe of Hudson**, screw type
No. 3 **J. N. LaPointe** double screw type
No. 3 **American** high speed, rack type

DRILLS, UPRIGHT, GANG AND HEAVY DUTY

20" **Excelsior** plain hand feed
20" **Silver** plain hand feed
20" **W. F. & J. Barnes** plain hand feed
21" **Superior** plain hand or back geared power feed, tapping attachment
21" **Cincinnati** plain hand feed
21" **Cincinnati** sliding head
21" **Cincinnati** direct geared mfg.
22" **Aurora** sliding head
22" **Barnes** sliding head, hand feed
22½" **W. F. & J. Barnes** stationary head, back gears, power feed
22½" **Mechanics** plain hand feed
24" **Cincinnati Bickford** sliding head, back geared power feed
24" **Cincinnati Drill Co.**, sliding head, power feed
25" **W. F. & J. Barnes** stationary head, back gears, power feed
25" **Superior** sliding head, back geared, power feed
26" **W. F. & J. Barnes** sliding head, back geared, power feed
26" **Bickford**, sliding head, back geared, power feed
26" **Hoefer** sliding head, back gears, power feed tapping attachment
28" **Aurora**, sliding sliding head, back gears, power feed
22½" **W. F. & John Barns**, 4 spdl. hy. dy.
24" **Barnes Drill Co.**, hy. dy. camel back

DRILLS, MISCELLANEOUS

Nos. 15½, 15½F and 16 Foote Burt for Multiple heads
Garvin, Nos. 0 and 00S, double end drilling and centering
Natco one and two-way lead screw tappers
Baker hydraulic, double end drill.
5 spindle **Detroit** automatic with fixtures
3 way **Foote Burt** for multiple heads
Avey motor driven unit heads, No. 2, ⅝" capacity
No. 3 **Milholland** two way drills, motor drive
4"x12" & 4"x72" **Sundstrand** double end drilling and centering
1" **Cleveland**, Model J, double end drilling, threading, pointing or turning
Type 8H **Natco** hyd. horizontal multiple
Barnes heavy duty vertical hydraulic for boring & drilling

FURNACES

No. 420 **Standard Fuel Engineering Co.**
No. 0 **Stewart** crucible
21"x32"x21" **Surface Combustion Co.** heat treating
45"x46"x45" heating for forge work
No. 515 **Standard Fuel Engineering Co.** pot type
No. 1D **American** rotary carburizing

GEAR CUTTERS

No. 18H **Gould & Eberhardt** universal gear hobber
8"x10"No. 1 **Lees Bradner** production hobber
14"x8" No. 5A **Lees Bradner** universal hobbers
26"x8" No. 3 **Brown & Sharpe** auto spur.
36"x6" **Gould & Eberhardt** spur gear cutter
48"x10" No. 4 **Brown & Sharpe** automatic spur
15" **Gleason** bevel gear quencher
Gleason circular finishing cutters, without blades
National Tool Co. (Cleveland) Model B gear and gear shaper cutter checking machine
Lipe gear tooth chamfering machine, double spindle
No. 3 **Barber Colman** gear hobber
18" **Gleason** bevel gear generator

ROLLS

No. 1A **Ajax** taper forging, motor drive.
54" **McKay** 19 roll sheet leveler
Bay City bending rolls, 4"x3/16"

SHEARS

⅝"x6" No. 54 **Hendley & Whittemore**, punch, shear, and rod cutter with angle shear attachment
No. 1 **Long & Allstatter** alligator
Lewis alligator, 10" blade
Newbold guillotine, 2" capacity
No. O-15 **Stanley Uni-shear**
36"x18 ga. Toledo No. 418 B.
No. 1 B **Campbell Nibbler**, 3/16"x24"
18" **Pels** all steel beam shear
10 KVA **"DYER"** Topeka 220 v. new

WELDERS

12 KVA **American Electric Fusion**, type BW 16.
17 KVA **Thomson Gibb**, 440 V., spot
20 KVA **Agnew**, type 10D, 440 V., spot
20 KVA **Taylor**, 440 V., spot, 14" reach
20 KW **Taylor Moesta**, 440 V., portable gun type spot
20 KW **National**, spot, 28" reach, 220 Volt
23 KVA **Winfield**, 440 V., spot
25 KW **Winfield**, spot, 220 V.
25 KW **Winfield**, 220 V., butt
30 KVA **Thomson**, 220 V., butt
35 KW **Federal**, type 60, 440 V., automatic upset butt
65 KW **Federal**, type 10A, 440 V., butt
150 KVA **American Electric Fusion**, type HJ 10, 440 volt, air operated multiple welder
150 KVA **Swift** flash butt welder, 440 Volt
375 KVA **Fisher "Autocrat"** press type.

MISCELLANEOUS

6A **Potter & Johnston** automatics
4'x¼" **Cincinnati** press brake
36" **Niles** car wheel vertical borer
22", 24" & 28" **Steinle** turret lathes
5" **Barrett** horizontal mill
4" **Beeman & Smith** double end boring mill
36" **Morton** draw cut shaper
12" **Dill** slotter.
3" No. 6 **Langelier** swager
Excello 9 spindle borer.
Blakeslee and conveyor spray type degreasers
AC die casting machine
No. 61AA **Bodine** screw & nut driver
Norton type 15 lapper

Mail us your list of surplus machinery and let's "Keep 'em Flying"

MILES MACHINERY CO. - - - Saginaw, Mich.

MISCELLANEOUS MACHINES

#13 **NATCO** Mult. spdl. rect. hd. bored 16 spdls, with 8-1¼" spindles
#60 **NATCO** 3-way Multiple Drill
25" **Barnes** B.G. P.F. Sliding Head Drill
25" **Rockford** B.G. P.F. Sliding Head Drill
#400 **Curtis Oil Extractor**, 2-bushel
4-spdl. **Henry & Wright**, 7" overhang
Rockford Sgl. End Hydraulic Boring Unit, with 3-sta., 54" dia. table
Gisholt Universal Tool Grinder

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28"x20'6" **Rahn-Carpenter Lathe** 14' between centers
12"x6' **Seneca Falls lathe**, loose change gear
#2 **Warner & Swasey** turret with cross slide turret
1 **Lodge & Davis** turret with cross slide turret
18"x8' **Champion**, quick change
Brake: **Robinson** toggle 5'
Broaching Machines, LePointe, #1, #3
Drill Presses: 28", 24" Hoefer: 25", 20", 40" Bement
Ceiling Suspended Drill Unlimited drilling area
2 50# **Bradley upright hammers**, m.d. like new
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Millers: 20"x24"x18" Ingersoll
Grinders: #20 Bryant Internal
300 other machinery items
Rock River ⅞" capacity **punch and shear**
MOTORS—new 5 H.P. for 3-phase, ball brg.

Also rebuilt motors.

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COLUMBUS, OHIO

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9"x18" **Porter Cable Lathe** (2)
No. 324 Adriance Spinning
26"x10' **LeBlond, Universal Crankshaft**

MILLING MACHINES

2" **Pratt & Whitney spline (duplex) (Double)**
No. 1 Foote Burt Surface Broach
New No. 3 Wigglesworth
No. 12 Knight Vertical
No. 30 Sunstrand Rigid Mill M.D.

TURRET LATHES

5D Potter & Johnstons
6D Potter & Johnston M.D.
2¼" & 24" Jones & Lamson steel HD. M.D.
3x36 Jones & Lamson steel Hd. M.D.
2 spindle Jones & Lamson steel Hd., M.D.
Goss & De Leeuw Chucking, 6"x6½"

DRILLS

3' Morris Radial En. Hd.M.D.
No. B16 Natco M.D. (2)
4 Spindle Taylor & Fenny M.D.

GEAR MACHINERY

6 Cimatool chamfering M.D.
No. 61 Fellows
No. 4—48" Brown & Sharpe Gear Cutter
Lees Bradner Gear Grinders (2)
9" Pratt & Whitney Gear Grinder

GRINDERS

No. 20 Heald Surface M.D.
No. 6 Bryant Internal M.D.
No. 72A-3 Heald Internal M.D.
No. 16A Blanchard M.D.

MISCELLANEOUS

8" Bullard Multimatic M.D.
15 KVA, Taylor Spot Welders
No. 1 Foote-Burt Duplex Surface Broach
8" Welland Standard Pipe Machine
No. 4 Hilles & Jones Double End Punch and Shear
No. 303 Bliss St. Side Gd. M.D.
No. 23 Steel Horning Press
2" Acme Bolt Threader

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17" x 8' **Sidney H.D. Lathe, Q.C. 3SCD, D.B.G.**
18" x 8' **LeBlond Lathe, 3 S.C.D. D.B.G. Q.C.**
21" x 10' **LeBlond H.D. 3 S.C.D. B.B.G. Q.C.**
20" x 8' **American Lathe, 3 S.C.D. D.B.G. Q.C.**
14" x 6' **Lodge & Shipley Lathe, 3 S.C.D. D.B.G. Q.C.**
20" x 8' **LeBlond H.D. Lathe, 3 S.C.D. D.B.G. Q.C.**
42" x 16' **Niles Lathe, Standard Change, Cone Drive.**
28" x 50" x 16' **Rahn Larmon Slid. Bed Gap Lathe, Q. C.**

GRINDERS

#60 Heald Internal, Belt Drive.
12" Pratt & Whitney Surface Belt Drive.
#14—20" Besley Disc Grinder, Belt Drive.
12" x 72" Cincinnati Universal, Belt Drive.
#41 Oliver Drill Grinder, M.D.

GEAR CUTTERS

#3—26" B & S Automatic Gear Cutter.
#1 Adams Gear Hobber, Belt Drive.

BORING MILLS

36" Bullard Vertical, Two Heads, M.D.

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2" Landis Pipe Machine.
2" Landis Dble. Spindle Bolt Threader.
½" Acme Bolt Cutter Class A.
1" Acme Bolt Cutter Class A.

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24" and 26" Barnes Upright Drills.
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GRINDER, 18' x 30' x 96' Norton Cyl., M.D.
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Pipe machines 2"—18".

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Eliminates Costly Hobbing

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Number 5

An internal gear had to be cut in the bottom of a cavity in a block of steel. After the preliminary machining operations had been performed, the block was chucked on a dividing head mounted on the table of a milling machine . . . A special form tool holder was inserted in the clapper-box of the "SLOTMASTER". . . . With this set-up the job was done quickly, cleanly, and accurately eliminating several costly hobbing and hand operations.

SLOTMASTER can be used on milling machines and provides double duty facilities at a minimum cost. It requires but little time to change-over from one head to the other. . . . The stroke of the ram is adjustable from 0 to 4" . . . the speeds range from 50 to 250 s.p.m. . . . The tool holder of the clapper box type, can be turned in any position. . . . All of the working parts are of tool steel heat treated and ground to close tolerances. . . . SLOTMASTER comes complete with pulleys, motor, belt and mounting adaptable to round over-arm or flat-on-round overarm milling machines.

Send for 4-page catalog and give the specifications of the milling machines that you wish to equip. Immediate deliveries on high priorities.

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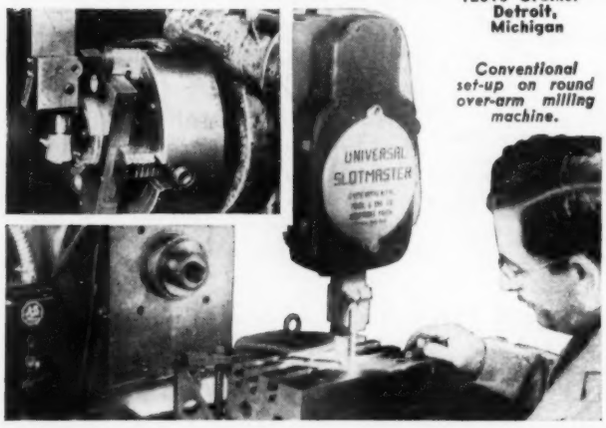

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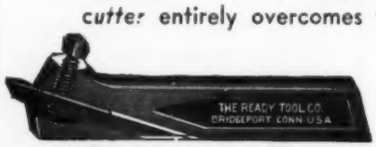

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Ryerson & Son, Inc., Jos. T., Chicago
Timken Steel & Tube Div., Canton, O.

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Copperweld Steel Co., Glassport, Pa.
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Jones & Laughlin Steel Corp., Pittsburgh
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Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
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Timken Steel & Tube Div., Canton, O.
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Carboloy Co., Detroit
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Cleveland Twist Drill Co., Cleveland
Cushman Chuck Co., Hartford, Conn.
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Firth-Sterling Steel Co., McKeesport, Pa.
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Gleason Works, Rochester, N. Y.
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Jacobs Mfg. Co., Hartford, Conn.
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McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Tool Co., Cleveland, O.
National Twist Drill & Tool Co., Detroit
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth, Mich.
Warner & Swasey Co., Cleveland

ATTACHMENTS, Broaching Machine
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Gisholt Machine Co., Madison, Wis.
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Pratt & Whitney Div., Niles-Bemont-Pond Co., Hartford, Conn.
Reed-Prentice Co., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Boston
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Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Lathe & Tool Co., Cincinnati
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Experimental Tool & Die Co., Detroit
Fray Machine Tool Co., Glendale, Calif.
Jefferson Mach. Tool Co., Cincinnati
Lempco Products, Inc., Bedford, O.
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Kempsmith Machine Co., Milwaukee
National Machine Tool Co., Cincinnati
Porter-Cable Mach. Co., Syracuse, N. Y.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Machine Tool Co., Springfield, Mass.

ATTACHMENTS, Planer
Cincinnati Planer Co., Cincinnati
Sellers & Co., Inc., Wm., Philadelphia

ATTACHMENTS, Screw-Machine
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Empire Tool Co., Detroit
Meisel Press Mfg. Co., Boston

ATTACHMENTS, Tapping
Avey Drilling Mach. Co., Cincinnati
Barber-Colman Co., Rockford, Ill.
Errington Mech. Lab., Stapleton, N. Y.
Greenlee Bros. & Co., Rockford, Ill.
Haskins Co., R. G., Chicago
Kingsbury Mach. Tool Corp., Keene, N. H.
Moline Tool Co., Moline, Ill.
Murchey Machine & Tool Co., Detroit
National Auto. Tool Co., Richmond, Ind.

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Norton Co., Worcester, Mass.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

BALLS, Brass, Bronze & Steel
Ball & Roller Bearing Co., Danbury, Conn.
Federal Bearings Co., Poughkeepsie, N. Y.
SKF Industries, Inc., Philadelphia
Waterbury Steel Ball Co., Poughkeepsie, N. Y.

BARRELS, Tumbling & Burnishing
Waterbury Steel Ball Co., Poughkeepsie, N. Y.

BARS, Boring
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Bullard Co., Bridgeport, Conn.
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Elmes Engrg. Wks., Chas. F., Chicago

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Lucas Machine Tool Co., Cleveland
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Michigan Tool Co., Detroit
National Twist Drill & Tool Co., Detroit
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Scully-Jones & Co., Chicago
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Universal Boring Mach. Co., Hudson, Mass.
Warner & Swasey Co., Cleveland
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BARS, Sine
Brown & Sharpe Mfg. Co., Providence, R. I.
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Bunting Brass & Bronze Co., Toledo, O.
Carlyle Johnson Machine Co., Manchester, Conn.
Johnson Bronze Co., New Castle, Pa.

BEARINGS, Babbitt
Bunting Brass & Bronze Co., Toledo, O.
Phosphor Bronze Smelting Co., Philadelphia

BEARINGS, Ball
Ball & Roller Bearing Co., Danbury, Conn.
Bantam Bearings Corp., So. Bend, Ind.
Bearings Co. of America, Lancaster, Pa.
Fafnir Bearing Co., New Britain, Conn.
Federal Bearings Co., Poughkeepsie, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
S. K. F. Industries, Inc., Philadelphia
Schatz Mfg. Co., Poughkeepsie, N. Y.
Torrington Co., Torrington, Conn.

BEARINGS, Needle & Quill
Bantam Bearings Corp., So. Bend, Ind.
Federal Bearings Co., Poughkeepsie, N. Y.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Roller Bearing Co. of Amer., Trenton, N. J.
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BEARINGS, Non-Metallic
Bakelite Corp., N. Y. C.

BEARINGS, Oilless & Graphite
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Carlyle Johnson Machine Co., Manchester, Conn.
Johnson Bronze Co., New Castle, Pa.

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Ball & Roller Bearing Co., Danbury, Conn.
Bantam Bearings Corp., So. Bend, Ind.
Fafnir Bearing Co., New Britain, Conn.
Norma-Hoffmann Bearings Corp., Stamford, Conn.
Roller Bearing Co. of Amer., Trenton, N. J.
S. K. F. Industries, Inc., Philadelphia
Timken Roller Bearing Co., Canton, O.

BEARINGS, Thrust
(See preceding classifications)

BELLOWS, Seamless Metal
Chicago Metal Hose Corp., Maywood, Ill.

BELTING, Leather
Greene, Tweed & Co., N. Y. C.
Houghton & Co., E. F. Philadelphia
Rhoads & Sons, J. E., Philadelphia

BELTING, Rubber & Fabric
Dayton Rubber Mfg. Co., Dayton, O.
Gates Rubber Co., Denver, Colo.

BELTS & BANDS, Abrasive
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Dumore Co., Racine, Wis.
Mid-West Abrasive Co., Detroit
Norton Company, Worcester, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Walls Sales Corp., N. Y. C.

BELTS, "V"
Allis-Chalmers Mfg. Co., Milwaukee
Dayton Rubber Mfg. Co., Dayton, O.
Gates Rubber Co., Denver, Col
Rhoads & Sons, J. E., Philadelphia

BENCHES, Shop
Baumbach Mfg. Co., E. A., Chicago
Delta Mfg. Co., Milwaukee
Hardinge Brothers, Inc., Elmira, N. Y.
Hill Acme Co., Cleveland
Lyon Metal Products, Inc., Aurora, Ill.
New Britain-Gridley Machine Div., New Britain, Conn.
Rivett Lathe & Grinder, Inc., Boston
Standard Pressed Steel Co., Jenkintown, Pa.
Walker-Turner Co., Plainfield, N. J.

BENDERS, Hand
O'Neil-Irwin Mfg. Co., Minneapolis

BENDING & STRAIGHTENING Machines
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Williams & Co., J. H., N. Y. C.

BINS, Tool & Parts (See **LOCKERS & SHELVING**)

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Bethlehem Steel Co., Bethlehem, Pa.
Carboloy Co., Detroit
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
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Haynes Stellite Co., N. Y. C.
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National Broach & Machine Co., Detroit
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
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Producto Machine Co., Bridgeport, Conn.
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Union Twist Drill Co., Athol, Mass.
Vanadium Alloys Steel Co., Pittsburgh
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.
Williams & Co., J. H., N. Y. C.

BLADES, Circular-Saw (See **SAW BLADES, Circular**)

BLADES, Cutter, Milling, Boring & Reaming (See **BITS, Tool**)

BLADES, Hack- & Band-Saw
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Atkins & Co., E. C., Indianapolis
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Norma-Hoffmann Bearings Corp., Stamford, Conn.
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Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
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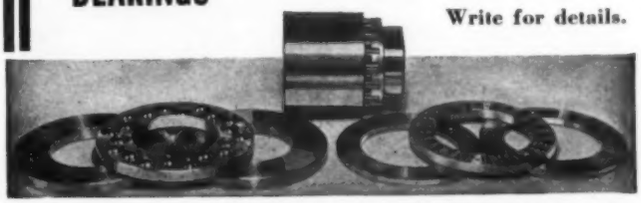

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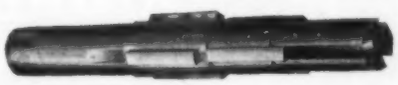

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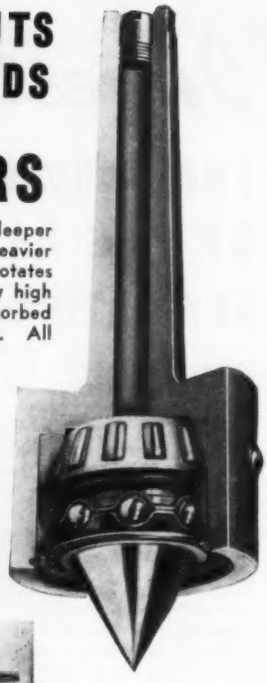

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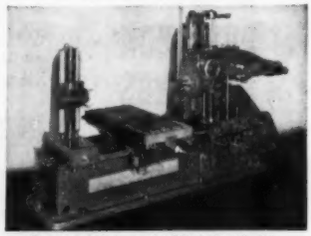

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CHUCKS, Collet (See Collets)

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Rivett Lathe & Grinder, Inc., Boston
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Potter & Johnston Machine Co., Pawtucket, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rivett Lathe & Grinder, Inc., Boston
Scherr Co., Geo., N. Y. C.
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Arter Grinding Mach. Co., Worcester, Mass.
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L-W Chuck Co., Toledo, O.
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Walker Co., O. S., Worcester, Mass.

CHUCKS, Motorized Electric
Cushman Chuck Co., Hartford, Conn.
Goss & deLeeuw Machine Co., New Britain, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Warner & Swasey Co., Cleveland

CHUCKS, Pneumatic
Cushman Chuck Co., Hartford, Conn.
Potter & Johnston Machine Co., Pawtucket, R. I.
Tomkins-Johnson Co., Jackson, Mich.
Warner & Swasey Co., Cleveland

CHUCKS, Ring-Wheel
Abrasive Mach. Tool Co., E. Providence, R. I.
Bridgeport Safety Emery Wheel Co., Inc., Bridgeport, Conn.
Gardner Machine Co., Beloit, Wis.

CHUCKS, Spring
Brown & Sharpe Mfg. Co., Providence, R. I.
Harnischfeger Corp., Milwaukee
Rivett Lathe & Grinder, Inc., Boston

CLAMPS, Machinist's
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
North Bros. Mfg. Co., Philadelphia
Williams & Co., J. H., N. Y. C.

CLEANERS, Metal (See COMPOUNDS, Cleaning)

CLEANING EQUIPMENT (See METAL-CLEANING EQUIPMENT)

CLOTH, Abrasive (See PAPER & CLOTH, Abrasive)

CLUTCHES, Friction
Ajax Mfg. Co., Euclid, Cleveland
Allis-Chalmers Mfg. Co., Milwaukee
Carlyle Johnson Machine Co., Manchester Conn.
Errington Mech. Lab., Stapleton, N. Y
Foote Bros Gear & Mach. Co., Chicago
Hill Acme Co., Cleveland, O.
Lipe-Rollway Corp., Syracuse, N. Y.
Morse Chain Co., Ithaca, N. Y.
Reeves Pulley Co., Indianapolis

COLLARS, Safety
American Pulley Co., Philadelphia
Carlyle Johnson Machine Co., Manchester, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

COLLARS, Spacing
Atkins & Co., E. C., Indianapolis
Hill Acme Co., Cleveland
Morse Twist Drill & Machine Co., New Bedford, Mass.
Scully-Jones & Co., Chicago
Standard Pressed Steel Co., Jenkintown, Pa.

COLLECTORS, Dust
Blake Co., Edward, Newton Centre, Mass.
Buffalo Forge Co., Buffalo, N. Y.
Covel Mfg. Co., Benton Harbor, Mich.
Torit Mfg. Co., St. Paul, Minn.

COLLETS
Atlas Press Co., Kalamazoo, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Lathe & Tool Co., Cincinnati
Cincinnati Milling Mach. Co., Cincinnati
Cleveland Automatic Mach. Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Consolidated Machine Tool Corp., Rochester, N. Y.
Cushman Chuck Co., Hartord, Conn.
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Hendey Machine Co., Torrington, Conn.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Acme Co., Cleveland
National Auto. Tool Co., Richmond, Ind.
National Twist Drill & Mach. Co., Detroit
New Britain-Gridley Machine Co., New Britain, Conn.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed Prentice Co., Worcester, Mass.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Universal Engrg. Co., Frankenmuth, Mich.
Van Norman Mach. Tool Co., Springfield, Mass.
Warner & Swasey Co., Cleveland

COMPARATORS, Dial
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.

COMPARATORS, Gear-Tooth & Screw-Thread
Farrel-Birmingham Co., Buffalo, N. Y.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.
Vard, Inc., Pasadena, Calif.

COMPASSES, Metal-Scribing (See CALIPERS & COMPASSES)

COMPOUNDS, Cleaning
Bullard Co., Bridgeport, Conn.
Detroit Rex Products Co., Detroit
Houghton & Co., E. F., Philadelphia
Magnus Chemical Co., Garwood, N. J
Oakite Products, N. Y. C.
Turco Products, Inc., Los Angeles

COMPOUNDS, Drawing, Metal & Wire
Houghton & Co., E. F., Philadelphia
Shell Oil Co., Inc., N. Y. C.

COMPOUNDS, Grinding & Polishing
Carborundum Co., Niagara Falls, N. Y.
National Broach & Machine Co., Detroit
Norton Co., Worcester, Mass.

COMPOUNDS, Plastic Molding
Bakelite Corp., N. Y. C.
Dow Chemical Co., Midland, Mich.
General Electric Co., Schenectady, N. Y.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

COMPOUNDS, Tempering & Case-Hardening
Houghton & Co., E. F., Philadelphia
Oakite Products, Inc., N. Y. C.
Strong, Carlisle & Hammond Co., Cleveland
Stuart Oil Co., D. A., Chicago

COMPRESSORS, Air & Gas
Allis-Chalmers Mfg. Co., Milwaukee
American Gas Furn. Co., Elizabeth, N. J.
Curtis Pneumatic Machry. Co., St. Louis
General Electric Co., Schenectady, N. Y.
Wright Mfg. Div. of Amer. Chain & Cable Co., York, Pa.

CONSULTANTS
Trundle Engrg. Co., Cleveland

CONTOUR MACHINES
Continental Machines, Inc., Minneapolis
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Sundstrand Mach. Tool Co., Rockford, Ill.

CONTRACT WORK (See also Index, last page)
Aluminum Co. of America, Pittsburgh
Baldwin Southwark Corp., Philadelphia
Bayard & Co., M. L., Philadelphia
Chapman-Vaive Mfg. Co., Boston (Heat-Treating)
Chromium Corp. of Amer., N.Y.C. (Plating)
Eastern Machine Screw Corp., New Haven, Conn.
Elmes Engrg. Wks., Chas. F., Chicago
Ericcson Screw Machine Prod. Inc., Brooklyn, N. Y.
Excello Corp., Detroit (Heat-Treating)
Fenn Mfg. Co., Hartford, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Hartford Special Machy. Co., Hartford, Conn.
Jefferson Mach. Tool Co., Cincinnati
Carlyle Johnson Machine Co., Manchester, Conn.
Kent-Owens Machine Co., Toledo, O.
Kropp Forge Co., Chicago (Forgings)
Liberty Tool & Gage Wks., Providence, R. I. (Jigs & Fixtures)
Meisel Press Mfg. Co., Boston
National Acme Co., Cleveland
National Twist Drill & Tool Co., Detroit
New Britain-Gridley Machine Co., New Britain, Conn. (Screw Machine Products)
Revere Copper & Brass, Inc., N. Y. C. (Forgings)
Scher Engrg. Co., George, Newark, N. J.
Surface Combustion Corp., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
United Chromium, Inc., N. Y. C., (Plating)
Vard, Inc., Pasadena, Calif.
Watson-Stillman Co., Roselle, N. J.
Williams & Co., J. H., N. Y. C.

CONTROLLERS, Motor
Allen-Bradley Co., Milwaukee
Allis-Chalmers Mfg. Co., Milwaukee
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
Lincoln Electric Co., Cleveland
Square D Co., Milwaukee
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

CONTROLLERS, Pressure & Temperature
American Gas Furn. Co., Elizabeth, N. J.
Brown Instrument Co., Philadelphia
Lindberg Engrg. Co., Chicago

CONTROLS, Flexible-Shaft (See SHAFTS, Flexible)

CONTROLS, Furnace
American Gas Furn. Co., Elizabeth, N. J.
Brown Instrument Co., Philadelphia
Lindberg Engrg. Co., Chicago
Strong, Carlisle & Hammond Mach. Co., Cleveland

CONTROLS, Hydraulic
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Sundstrand Mach. Tool Co., Rockford, Ill.
Watson-Stillman Co., Roselle, N. J.

CONVEYORS
Allis-Chalmers Mfg. Co., Milwaukee
Mathews Conveyer Co., Ellwood City, Pa.
Standard Conveyor Co., N. St. Paul, Minn.

COOLANT SYSTEMS, Portable
Gray Mills Co., Chicago

COOLANTS, Cutting, Drilling & Grinding
Carborundum Co., Niagara Falls, N. Y.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Oakite Products, Inc., N. Y. C.
Shell Oil Co., Inc., N. Y. C.
Socony-Vacuum Oil Co., Inc., N. Y. C.
Standard Oil Co. of Ind., Chicago
Stuart Oil Co., Ltd., D. A., Chicago
Sun Oil Co., Philadelphia
Tidewater Associated Oil Co., N. Y. C

COUNTERBORES
Barnes Drill Co., Rockford, Ill.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Wendt Sonis Co., Hannibal, Mo.

COUNTERSHAFTS
American Tool Works Co., Cincinnati
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Lathe & Tool Co., Cincinnati
Earle Gear & Mach. Co., Philadelphia
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
Hill Acme Co., Cleveland
LeBlond Mach. Tool Co., R. K., Cincinnati
Rivett Lathe & Grinder, Inc., Boston
Stow Mfg. Co., Binghamton, N. Y.
Warner & Swasey Co., Cleveland

COUNTERSINKS (See DRILLS, Twist)

COUNTERS, Revolution & Stroke
Brown & Sharpe Mfg. Co., Providence, R. I.

WHERE-TO-BUY DIRECTORY

Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

COUPLINGS, Hose
Cleveland Pneu. Tool Co., Cleveland
Schrader's, Son, A., Brooklyn, N. Y.

COUPLINGS, Shaft, Flexible
Allis-Chalmers Mfg. Co., Milwaukee
Delta Mfg. Co., Milwaukee
Earle Gear & Mach. Co., Philadelphia
Farrel-Birmingham Co., Buffalo, N. Y.
Foote Bros. Gear & Mach. Co., Chicago
Hill Acme Co., Cleveland
Morse Chain Co., Ithaca, N. Y.
Nicholson & Co., W. H., Wilkes-Barre, Pa.

COUPLINGS, Shaft, Non-Flexible
General Electric Co., Schenectady, N. Y.
Hill Acme Co., Cleveland
Standard Pressed Steel Co., Jenkintown, Pa.

CRANES, Jib
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis Pneumatic Machy. Co., St. Louis
Harnischfeger Corp., Milwaukee
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CRANES, Portable
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CRANES, Overhead Traveling
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engrg. Co., Wickliffe, O.
Curtis Pneumatic Machry. Co., St. Louis
Harnischfeger Corp., Milwaukee
Wright Mfg. Div., American Chain & Cable Co., Inc., York, Pa.

CUPS, Oil & Grease
Gits Bros. Mfg. Co., Chicago

CUSHIONS, Die
V. & O. Press Co., Hudson, N. Y.

CUTTERS, Angle
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
McCrosky Tool Co., Meadville, Pa.
McKenna Metals Co., Latrobe, Pa.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago

CUTTERS, Die-Sinking
Detroit Tap & Tool Co., Detroit
Gairing Tool Co., Detroit
Gorton Machine Co., Geo., Racine, Wis.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.

CUTTERS, Formed
Atkins & Co., E. C., Indianapolis
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Detroit
Cleveland Twist Drill Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Tomkins Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Weldon Tool Co., Cleveland

CUTTERS, Gear
Adams Co., Dubuque, Iowa
Bantam Bearings Corp., S. Bend, Ind.
Barber-Colman Co., Rockford, Ill.
Bilgram Gear & Mach. Wks., Philadelphia
Brown & Sharpe Mfg. Co., Providence, R. I.
Cross Gear & Machine Co., Detroit
Farrel-Birmingham Co., Buffalo, N. Y.
Fellows Gear Shaper Co., Springfield, Vt.
Gleason Works, Rochester, N. Y.
Illinois Tool Works, Chicago
Lees-Bradner Co., Cleveland
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Scherr Co., Geo., N. Y. C.
Standard Tool Co., Cleveland
Stow Mfg. Co., Binghamton, N. Y.
Taylor Machine Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Waltham Mach. Wks., Waltham, Mass.

CUTTERS, Hand Pipe (See STOCKS, DIES & CUTTERS, Pipe)

CUTTERS, Keyseater
Baker Bros., Inc., Toledo, O.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Davis Keyseater Co., Rochester, N. Y.
Ex-Cell-O Corp., Detroit
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Mitts & Merrill, Saginaw, Mich.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Broach & Mach. Co., Detroit
National Machine Tool Co., Cincinnati
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

CUTTERS, Milling
Adams Company, Dubuque, Ia.
Atlas Press Co., Kalamazoo, Mich.
Barber-Colman Co., Rockford, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Crafts Co., Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Gorton Mach. Co., George, Racine, Wis.
Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Kearney & Trecker Corp., Milwaukee
Lovejoy Tool Co., Inc., Springfield, Vt.
McCrosky Tool Corp., Meadville, Pa.
McKenna Metals Co., Latrobe, Pa.
Michigan Tool Co., Detroit
Modern Tool Works, Rochester, N. Y.
Morse Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Tomkins-Johnson Co., Jackson, Mich.
Union Twist Drill Co., Athol, Mass.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Waltham Mach. Wks., Waltham, Mass.
Weldon Tool Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.
Williams & Co., J. H., N. Y. C.

CUTTERS, Wire
Ideal Commutator Dresser Co., Chicago

CUTTING-OFF MACHINES (See SAWS)

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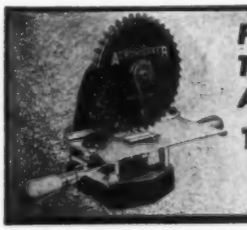
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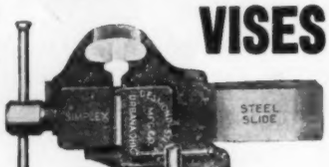

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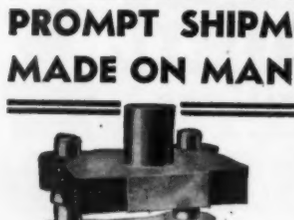

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Challenge Machry Co., Grand Haven, Mich.
de Sanno & Sons, Inc., A. P., Philadelphia
Porter McLeod Machine Tool Co., Inc., Hatfield, Mass.
Racine Tool & Mach. Co., Racine, Wis.

CYLINDERS, Air (See **TANKS & CYLINDERS, Air**)

CYLINDERS, Hydraulic (See **PRESSES, Hydraulic**)

DEALERS, Machinery (See **Searchlight Section**)

DEGREASERS (See **Metal Cleaning Equipment**)

DEMAGNETIZERS
Abrasive Machine Tool Co., E. Providence, R. I.
Blanchard Mach. Co., Cambridge, Mass.
L-W Chuck Co., Toledo, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Walker Co., O. S., Worcester, Mass.

DIAMONDS, Industrial
Carboloy Co. Inc., Detroit
Crafts Co., Inc., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana, O.
Diamond Tool Co., Chicago
Koebel Diamond Tool Co., Detroit
Smit & Sons, Inc., J. K., N. Y. C.

DIE-CASTING MACHINES
Continental Machines, Inc., Minneapolis
Reed-Prentice Corp., Worcester, Mass.

DIE-HEADS, Threading
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Eastern Machine Screw Corp., New Haven, Conn.
Errington Mech. Lab., Stapleton, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap and Die Corp., Greenfield, Mass.
Hill Acme Co., Cleveland
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland
Oster Mfg. Co., Cleveland
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Warner & Swasey Co., Cleveland

DIE-MAKERS' SUPPLIES
Baumbach Mfg. Co., E. A., Chicago
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Carboloy Co., Inc., Detroit
Danly Mach. Specialties, Inc., Chicago
Dykem Co., St. Louis
Lufkin Rule Co., Saginaw, Mich.
Masonite Corp., Chicago
Producto Mach. Co., Bridgeport, Conn.
Starrett Co., L. S., Athol, Mass.

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Cincinnati Milling Mach. Co., Cincinnati
Continental Machines, Inc., Minneapolis
Gorton Machine Co., Geo., Racine, Wis.
Henry & Wright Mfg. Co., Hartford, Conn.
Illinois Tool Works, Chicago
Johnson Tool Co., E. Providence, R. I.
Peerless Machine Co., Racine, Wis.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Co., Worcester, Mass.

DIE-SETS
Baumbach Mfg. Co., E. A., Chicago
Card Mfg. Co., S. W., Mansfield, Mass.
Dandy Mach. Specialties, Inc., Chicago
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

DIE-SINKING MACHINES
Cincinnati Milling Mach. Co., Cincinnati
Gorton Machine Co., Geo., Racine, Wis.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.

DIES, Marking & Embossing
Acromark Co., Elizabeth, N. J.
Matthews & Co., Jas. H., Pittsburgh
Noble & Westbrook Mfg. Co., East Hartford, Conn.

DIES, Screw-Cutting, Adjustable
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Eastern Machine Screw Corp., New Haven, Conn.
Errington Mech. Lab., Stapleton, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Jones & Lamson Mach. Co., Springfield, Vt.
Landis Machine Co., Waynesboro, Pa.
Modern Tool Works, Rochester, N. Y.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Acme Co., Cleveland
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Threadwell Tap & Die Co., Greenfield, Mass.

DIES, Sheet-Metal & Forging
Hamilton Tool Co., Hamilton, O.
Scully-Jones & Co., Chicago
Taft-Peirce Mfg. Co., Woonsocket, R. I.

DIES, Solid Bolt & Pipe
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Consolidated Machine Tool Corp., Rochester, N. Y.
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Machine Co., New Bedford, Mass.
Oster Mfg. Co., Cleveland
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Warner & Swasey Co., Cleveland

DIES, Sub-Press
Baumbach Mfg. Co., E. A., Chicago
Danly Mach. Specialties, Inc., Chicago
Producto Machine Co., Bridgeport, Conn.
V & O Press Co., Hudson, N. Y.
Waltham Mach. Works, Waltham, Mass

DIES, Wire-Drawing & Extrusion
Carboloy Co., Inc., Detroit
Crafts Co., Arthur A., Boston
Firth-Sterling Steel Co., McKeesport, Pa.
Illinois Tool Works, Chicago
Metal Carbides Corp., Youngstown, O.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vascoloy-Ramet Corp., N. Chicago, Ill.

DISKS, Abrasive (See **WHEELS, Grinding & Polishing**)

DISKS, Circular Cuttting
Atkins & Co., E. C., Indianapolis
Disston & Sons, Inc., Henry, Philadelphia
Morse Twist Drill and Machine Co., New Bedford, Mass.

DIVIDERS (See **CALIPERS & COMPASSES**)

DOGS, Lathe & Milling-Machine
Armstrong Bros. Tool Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Cincinnati Lathe & Tool Co., Cincinnati
Hendey Machine Co., Torrington, Conn.
LeBlond Mach. Tool Co., R. K., Cincinnati
Ready Tool Co., Bridgeport, Conn.
Sturdimatic Tool Co., Detroit
Williams & Co., J. H., N. Y. C.

DRESSERS, Grinding Wheel
American Swiss File & Tool Co., Elizabeth, N. J.
Atkins & Co., E. C., Indianapolis
Black & Decker Mfg. Co., Towson, Md.
Carboloy Co., Inc., Detroit
Carborundum Co., Niagara Falls, N. Y.
Chicago Wheel & Mfg. Co., Chicago
Crafts Co., Inc., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana, O.
Disston & Sons, Inc., Henry, Philadelphia
Dumore Co., Racine, Wis.
Ideal Commutator Dresser Co., Chicago

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Norton Co., Worcester, Mass.
Schultz & Anderson Co., Newark (Radius)
Smit & Sons, J. K., N. Y. C.
Standard Tool Co., Cleveland
Victor Machinery Exchange, N. Y. C.

DRESSING, Belt
Houghton & Co., E. F., Philadelphia
Rhoads & Sons, J. E., Philadelphia
Tide Water Associated Oil Co., N. Y. C.
White & Bagley, Worcester, Mass.

DRIERS, Centrifugal
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.

DRIFTS, Drill
Armstrong Bros. Tool Co., Chicago
Cleveland Twist Drill Co., Cleveland
Morse Twist Drill & Machine Co., New Bedford, Mass.
Standard Tool Co., Cleveland
Williams & Co., J. H., N. Y. C.

DRILLROD, Steel Tool (See STEEL, Tool)

DRILLS, Automatic & Semi-Automatic
Avey Drilling Machine Co., Cincinnati
Baker Bros., Inc., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill
Barnes Drill Co., Rockford, Ill.
Bodine Corp., Bridgeport, Conn.
Bradford Machine Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Cross Gear and Machine Co., Detroit
Davis & Thompson Co., Milwaukee
Ex-Cell-O Corp., Detroit
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Goss & deLeeuw Machine Co., New Britain, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.
North Bros. Mfg. Co., Philadelphia
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Snyder Tool & Engrg. Co., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.

DRILLS, Bench
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Barnes Co., W. F. & John, Rockford, Ill.
Black & Decker Mfg. Co., Towson, Md.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Delta Mfg. Co., Milwaukee
Dumore Co., Racine, Wis.
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Hamilton Tool Co., Hamilton, O.
Henry & Wright Mfg. Co., Hartford, Conn.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
North Bros. Mfg. Co., Philadelphia
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Production Mach. Co., Greenfield, Mass.
Ryerson & Son, Jos. T., Chicago
Schauer Mach. Co., Cincinnati
Skilsaw, Inc., Chicago
Walker-Turner Co., Plainfield, N. J.

DRILLS, Breast (See TOOLS, Hand)

DRILLS, Center
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill and Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Co., Div. Niles-Bement-Pond Co., Hartford, Conn.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exchange, N. Y. C.

DRILLS, Column-Type
Atlas Press Co., Kalamazoo, Mich.
Baker Bros., Inc., Toledo, O.
Barnes Drill Co., Rockford, Ill.
Barnes Co., W. F. & John, Rockford, Ill.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Dalzen Tool & Mfg. Co., Detroit
Davis & Thompson Co., Milwaukee
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
General Machy. Corp., Hamilton, O.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.
Snyder Tool & Engrg. Co., Detroit

DRILLS, Core
Carboloy Co., Inc., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Haynes Stellite Co., N. Y. C.
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Wendt Sonis Co., Hannibal, Mo.

DRILLS, Flat (See DRILLS, Twist & Flat)

DRILLS, Hand (See TOOLS, Hand)

DRILLS, Horizontal
Avey Drilling Machine Co., Cincinnati
Baker Bros. Inc., Toledo, Ohio
Barnes Co., W. F. & John, Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bradford Machine Tool Co., Cincinnati
Buhr Mach. Tool Co., Ann Arbor, Mich.
Cincinnati Gilbert Machine Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
Murchey Machine and Tool Co., Detroit
National Auto. Tool Co., Richmond, Ind.
Ryerson & Son, Jos. T., Chicago
Sellers & Co., Inc., Wm., Philadelphia
Snyder Tool & Engrg. Co., Detroit
Universal Boring Mach. Co., Hudson, Mass.

DRILLS, Deep-Hole
Barnes Co., W. F. & John, Rockford, Ill.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.

DRILLS, Multi-Spindle or Gang
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Baker Bros. Inc., Toledo, O.
Barnes Co., W. F. & John, Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bodine Corp., Bridgeport, Conn.
Bradford Machine Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Buhr Mach. Tool Co., Ann Arbor, Mich.
Bullard Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati
Consolidated Machine Tool Corp., Rochester, N. Y.
Davis & Thompson Co., Milwaukee
Delta Mfg. Co., Milwaukee
Ex-Cell-O Corp., Detroit
Foote-Burt Co., Cleveland
Fosdick Machine Tool Co., Cincinnati
Grant Mfg. & Mach. Co., Bridgeport, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Henry & Wright Mfg. Co., Hartford, Conn.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ill.
National Auto. Tool Co., Richmond, Ind.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Snyder Tool & Engrg. Co., Detroit

DRILLS, Portable Electric (See TOOLS, Portable Electric)

DRILLS, Portable Pneumatic (See TOOLS, Portable Pneumatic)

DRILLS, Radial
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Bryant Machinery & Engrg. Co., Chicago
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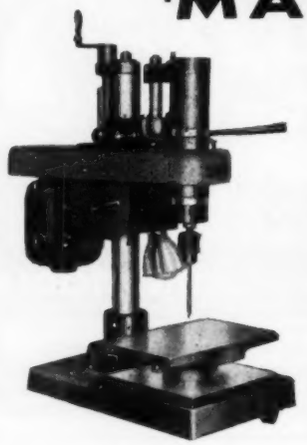

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Morris Machine Tool Co., Cincinnati

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Scherr Co., Geo., N. Y. C.
Walker-Turner Co., Inc., Plainfield, N. J.

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Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.
Victor Machinery Exchange, N. Y. C.

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Rivett Lathe & Grinder, Inc., Boston
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DRIVES, Variable-Speed (See **TRANSMISSIONS, Variable-Speed**)

DRIVES, "V"-Belt
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DRIVES, Worm
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Bilgram Gear & Mach. Wks., Philadelphia
Detroit Tap & Tool Co., Detroit
Earle Gear & Mach. Co., Philadelphia
Ganschow Gear Co., Chicago
Gear Specialties, Inc., Chicago
Grant Gear Works, Boston
Michigan Tool Co., Detroit
Perkins Machine & Gear Co., Springfield, Mass.
Philadelphia Gear Works, Philadelphia

DRYING Machines (See **MACHINES, Washing and Drying**)

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Air Reduction, N. Y. C.
Aluminum Co. of America, Pittsburgh
American Brass Co., Waterbury, Conn.
American Steel & Wire Co., Cleveland
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., Milwaukee
Haynes-Stellite Co., N. Y. C.
Lincoln Electric Co., Cleveland
McKay Co., Pittsburgh, Pa.
Page Steel & Wire Div., Am. Chain & Cable Co., Monessen, Pa.
Roebling's Sons Co., John A., Trenton, N. J.
Ryerson & Son, Inc., Jos. T., Chicago
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

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Barrett Co., Leon J., Worcester, Mass.

ENAMELS (See **PAINTS, VARNISHES, etc.**)

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Gorton Machine Co., Geo., Racine, Wis.
Ideal Commutator Dresser Co., Chicago
Moore Mfg. Co., Wm., Chicago
Reed-Prentice Co., Worcester, Mass.

ETCHERS, Electric

EXTRACTORS, Centrifugal Oil (See **SEPARATORS, Centrifugal**)

EXTRACTORS, Screw
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Standard Tool Co., Cleveland

FANS, Man-Cooler (See **BLOWERS**)

FASTENERS, Lacing and Clamps, Belt
Rhoads & Sons, J. E., Philadelphia

FEEDS, Die (See **FEEDS, Press**)

FEEDS, Hydraulic
American Engineering Co., Philadelphia
Ex-Cell-O Tool Corp., Detroit
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Sundstrand Mach. Tool Co., Rockford, Ill.

FEEDS, Press
Federal Press Co., Elkhart, Ind.
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Stow Mfg. Co., Inc., Binghamton, N. Y.
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Disston & Sons, Inc., Henry, Philadelphia
Hamilton Tool Co., Hamilton, O.
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Ames Co., B. C., Waltham, Mass.
Continental Machines Inc., Milwaukee
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Illinois Tool Co., Chicago
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Cleveland Pneu. Tool Co., Cleveland
Curtis Pneu. Machy. Co., St. Louis
Norton Company, Worcester, Mass.

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Mitts & Merrill, Saginaw, Mich.
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Watson-Stillman Co., Roselle, N. J.

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American Steel & Wire Co., Chicago
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Republic Steel Corp., Cleveland
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Oster Mfg. Co., Cleveland

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Haskins Mfg. Co., R. G., Chicago
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Lincoln Electric Co., Cleveland

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Henry & Wright Mfg. Co., Hartford, Conn.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Nilson Machine Co., A. H., Bridgeport, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Watson-Stillman Co., Roselle, N. J.
Yoder Co., Cleveland
Zeh & Hahnemann Co., Newark, N. J.

FURNACES, Electric
Electric Furnace Co., Salem, O.
General Electric Co., Schenectady, N. Y.
Lindberg Engineering Co., Chicago
Surface Combustion Corp., Toledo, O.
Westinghouse Electric & Mfg. Co., E. Pittsburgh

FURNACES, Gas
American Gas Furn. Co., Elizabeth, N. J.
Chicago Flexible Shaft Co., Chicago
Electric Furnace Co., Salem, Ohio
Hones, Inc., Chas. A. Baldwin, N. Y.
Lindberg Engineering Co., Chicago
Strong, Carlisle & Hammond Co., Cleveland
Surface Combustion Corp., Toledo, O.

FURNACES, Oil
Chicago Flexible Shaft Co., Chicago
Electric Furnace Co., Salem, O.
Surface Combustion Corp., Toledo

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Lyon Metal Prod., Inc., Aurora, Ill.
New Britain-Gridley Machine Co., New Britain, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.

GAGES, Amplifying
Federal Products Corp., Providence, R. I.
Pratt & Whitney Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.

GAGES, Caliper
Brown & Sharpe Mfg. Co., Providence, R. I.
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T., Providence, R. I.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Williams Co., J. H., N. Y. C.

GAGES, Comparator
Ames Co., B. C., Waltham, Mass.
Federal Products Corp., Providence, R. I.
Jones & Lamson Mach. Co., Springfield, Vt.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Depth
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Continental Machines, Inc., Minneapolis
Federal Products Corp., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Dial
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Comtor Co., Waltham, Mass.
Federal Products Corp., Providence, R. I.
Randall & Stickney, Waltham, Mass.
Standard Gage Co., Poughkeepsie, N. Y.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Drill-Center
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Morse Twist Drill Co., New Bedford, Mass.
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
Starrett Co., L. S., Athol, Mass.
Union Twist Drill Co., Athol, Mass.

GAGES, Height
Brown & Sharpe Mfg. Co., Providence, R. I.
Continental Machines, Inc., Minneapolis
Lufkin Rule Co., Saginaw, Mich.
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

GAGES, Plug & Ring
Brown & Sharpe Mfg. Co., Providence, R. I.
Cadillac Gage Co., Detroit
Carboloy Co., Detroit
Comtor Co., Waltham, Mass.
Crafts Co., Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Federal Products Corp., Providence, R. I.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Knibbe Mfg. Co., Detroit
Lincoln Park Tool & Gage Co., Lincoln Park, Mich.
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
Pratt & Whitney Div. Niles-Bement-Pond Co., Hartford, Conn.
Scherr Co., Inc., Geo., N. Y. C.
Sheffield Corp., Dayton, O.
Slocomb Co., J. T., Providence, R. I.
Standard Gage Co., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vard, Inc., Pasadena, Calif.
Williams Co., J. H., N. Y. C.

GAGES, Pressure
Baldwin-Southwark Corp., Philadelphia
Brown Instrument Co., Philadelphia

GAGES, Profile
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Standard Gage Co., Poughkeepsie, N. Y.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

GAGES, Snap (See GAGES, Plug & Ring)

GAGES, Surface
Ames Co., B. C., Waltham, Mass.
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
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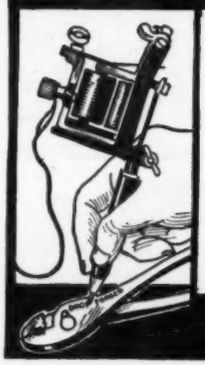

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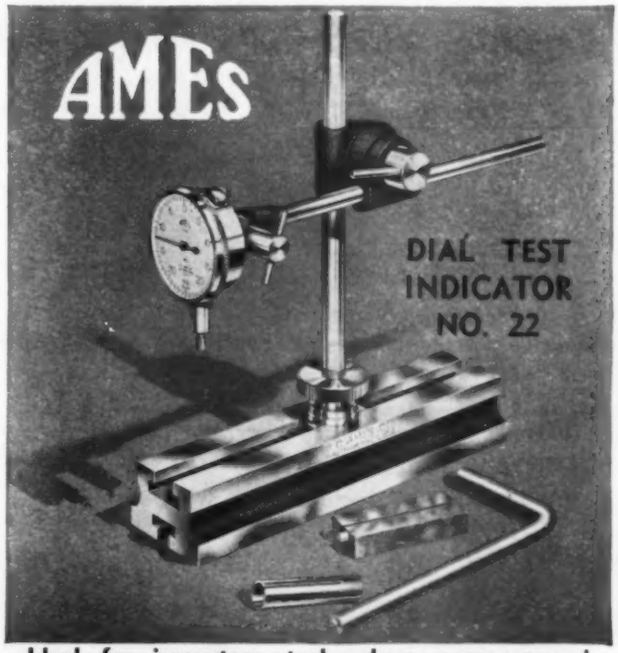

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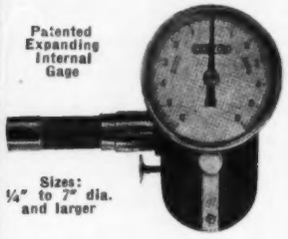

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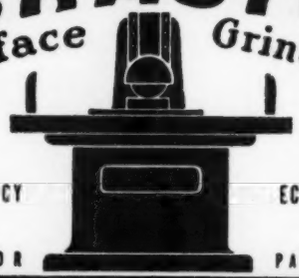

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Experimental Tool & Die Co., Detroit

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Etteo Tool Co., Brooklyn, N. Y.
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Greenlee Bros. & Co., Rockford, Ill.
Kingsbury Mach. Tool Co., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
National Auto. Tool Co., Richmond, Ind.

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Barber-Colman Co., Rockford, Ill.
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Scherr Co., Geo., N. Y. C.

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Brown & Sharpe Mfg. Co., Providence, R. I.
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Haynes Stellite Co., N. Y. C.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Union Twist Drill Co., Athol, Mass.

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Ford Chain Block Div., Am. Chain & Cable Co., Philadelphia
Wright Mfg. Div. of Am. Chain Cable Co., York, Pa.

HOISTS, Electric
Allis-Chalmers Mfg. Co., Milwaukee
American Engrg. Co., Philadelphia
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Harnischfeger Corp., Milwaukee
Philadelphia Gear Works, Philadelphia
Wright Mfg. Div., Amer. Chain & Cable Co., York, Pa.

HOISTS, Pneumatic
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Tomkins-Johnson Co., Jackson, Mich.

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Auto Ordnance Corp., Bridgeport, Conn.
Cincinnati Lathe & Tool Co., Cincinnati
Detroit Tap & Tool Co., Detroit
Errington Mech. Lab., Stapleton, N. Y.
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Michigan Tool Co., Detroit
Morse Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Sturdimatic Tool Co., Detroit
Warner & Swasey Co., Cleveland
Williams & Co., J. H., N. Y. C.

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Barnes Drill Co., Rockford, Ill.
Barnes Co., W. F., & John, Rockford, Ill.
Bay State Abrasive Products Co., Westboro, Mass.
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Micromatic Hone Corp., Detroit
Norton Co., Worcester, Mass.
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Kropp Forge Co., Chicago
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HOSE, Rubber
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Lempco Products, Inc., Bedford, O.
Watson-Stillman Co., Roselle, N. J.

INDEXING FIXTURES (See FIXTURES, Indexing)

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Brown Instrument Co., Philadelphia
Scherr Co., Inc., Geo., N. Y. C.
Starrett Co., L. S., Athol, Mass.

INDICATORS, Temperature
Brown Instrument Co., Philadelphia

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Wilson Mechanical Inst. Co., N. Y. C.

INSTRUMENTS, Optical Inspection
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Portman Mach. Tool Co., Mt. Vernon, N. Y.
Vard, Inc., Pasadena, Calif.

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Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

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National Auto. Tool Co., Richmond, Ind.
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Mitts & Merrill, Saginaw, Mich.
National Machine Tool Co., Cincinnati
Reed-Prentice Corp., Worcester, Mass.

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Excello Corp., Detroit
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Ultra-Lap Mach. Co., Detroit

LAPPERS, Cylindrical & Flat
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Ex-Cell-O Corp., Detroit
Moline Tool Co., Moline, Ill.
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Sellers & Co., Inc., Wm., Philadelphia
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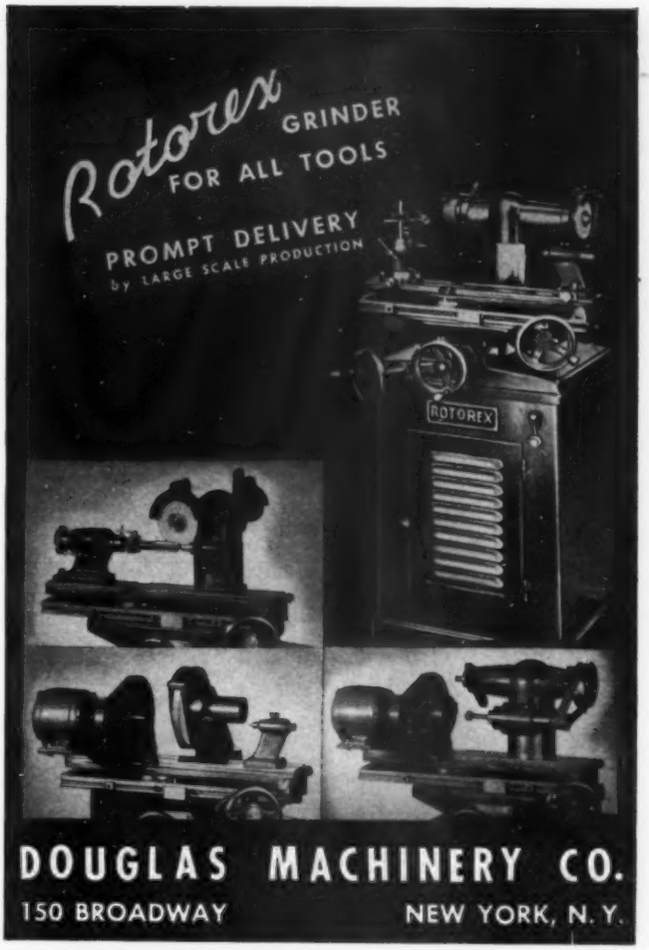

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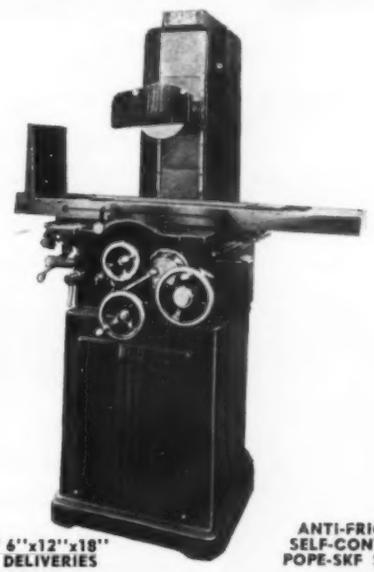

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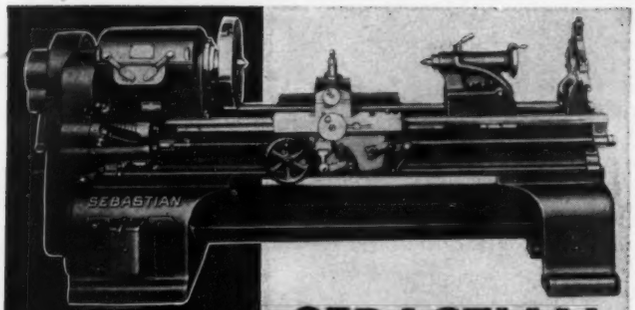

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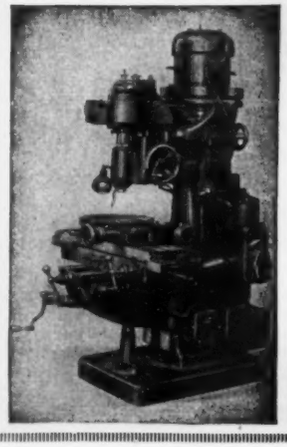

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Cincinnati Gilbert Machine Tool Co., Cincinnati
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Seneca Falls Mach. Co., Seneca Falls, N. Y.
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American Tool Works Co., Cincinnati

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Springfield Mach. Tool Co., Springfield, O.
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Sundstrand Mach. Tool Co., Rockford, Ill.

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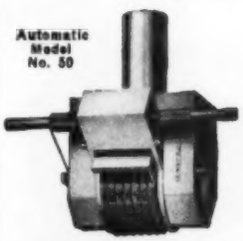

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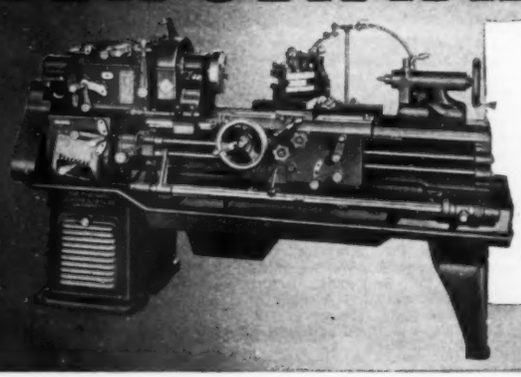

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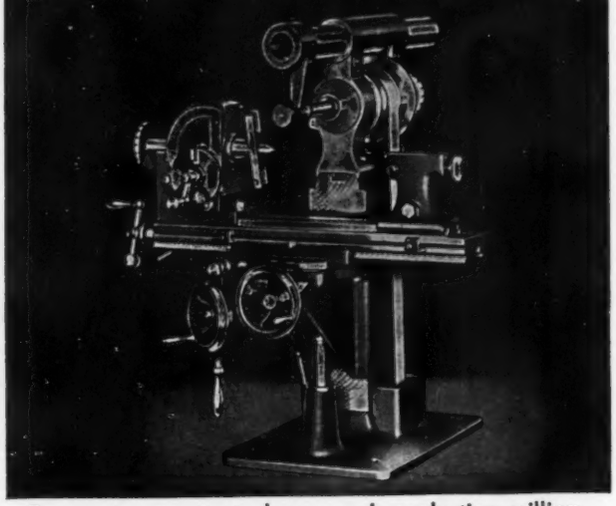

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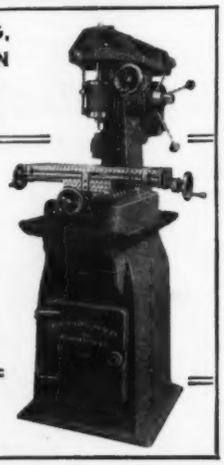

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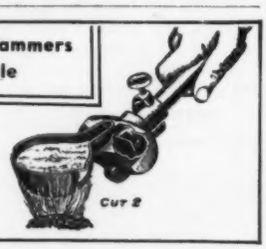

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Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Mach. Tool Co., Springfield, Mass.
Wigglesworth Machine Tool Co., Cambridge, Mass.

MILLERS, Plain & Universal
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Douglas Machinery Co., Inc., N. Y. C.
Fray Mach. Tool Co., Glendale, Calif.
Gorton Machine Co., Geo., Racine, Wis.
Granite State Mach. Co., Inc., Manchester, N. H.
Hardinge Brothers, Inc., Elmira, N. Y.
Jefferson Mach. Tool Co., Cincinnati
Kearney & Trecker Corp., Milwaukee
Kempsmith Machine Co., Milwaukee
Kent-Owens Machine Co., Toledo, O.
Lucas & Son, Inc., J. L., Bridgeport, Conn.
Knight Machinery Co., W. B., St. Louis
Machinery Mfg. Co., Chicago
Nichols & Sons, W. H., Waltham, Mass.
Ohio Machine Tool Co., Kenton, O.
Producto Machine Co., Bridgeport, Conn.
Sidney Machine Tool Co., Sidney, O.
Van Norman Machine Tool Co., Springfield, Mass.

MILLERS, Planer Type
Cincinnati Planer Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Fitchburg Engrg. Corp., Fitchburg, Mass.
General Machinery Corp., Hamilton, O.
Kearney & Trecker Corp., Milwaukee
Sellers & Co., Inc., Wm., Philadelphia

MILLERS, Planetary
Plan-O-Mill Corp., Royal Oak, Mich.

MILLERS, Profile
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Gorton Machine Co., Geo., Racine, Wis.
Knight Machinery Co., W. B., St. Louis
Morey Machinery Co., Inc., N. Y. C.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.

MILLERS, Thread
Adams Co., Dubuque, Iowa
Cleveland Auto. Mach. Co., Cleveland
Coulter Mach. Co., Jas., Bridgeport, Conn.
Hanson-Whitney Mach. Co., Hartford, Conn.
Lees-Bradner Co., Cleveland
Plan-O-Mill Corp., Royal Oak, Mich.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Rivett Lathe & Grinder, Inc., Boston
Scherr Co., Inc., Geo., N. Y. C.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waltham Mach. Works, Waltham, Mass.

MILLERS, Vertical
Blank & Buxton Machy. Co., Jackson, Mich.
Brown & Sharpe Mfg. Co., Providence, R. I.
Cincinnati Milling Mach. Co., Cincinnati
Consolidated Mach. Tool Corp., Rochester, N. Y.
Coulter Machine Co., James, Bridgeport, Conn.
General Machinery Corp., Hamilton, O.
Gorton Machine Co., Geo., Racine, Wis.
Granite State Mach. Co., Inc., Manchester, N. H.
Hardinge Bros., Inc., Elmira, N. Y.
Jefferson Mach. Tool Co., Cincinnati
Kearney & Trecker Corp., Milwaukee
Kempsmith Mfg. Co., Milwaukee
Knight Machinery Co., W. B., St. Louis
Linley Bros. Co., Bridgeport, Conn.
Machinery Mfg. Co., Los Angeles
Morey Machinery Co., Inc., N. Y. C.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Machine Co., Bridgeport, Conn.
Reed-Prentice Corp., Worcester, Mass.
Sidney Machine Tool Co., Sidney, O.
Sommer & Adams Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Van Norman Machine Tool Co., Springfield, Mass.

MOLDING MACHINES, Plastic
Adams Co., Dubuque, Iowa
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Reed-Prentice Corp., Worcester, Mass.
Watson-Stillman Co., Roselle, N. J.

MOLDS, Lead Hammer
Johnson Tool Co., Inc., E. Providence, R. I.

MOLYBDENUM
Molybdenum Corp. of America, Pittsburgh

MOTORS, Electric
Allis-Chalmers Mfg. Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Century Electric Co., St. Louis
Dumore Co., Racine, Wis.
General Electric Co., Schenectady, N. Y.
Harnischfeger Corp., Milwaukee
Howell Elec. Motors Co., Howell, Mich.
Lincoln Electric Co., Cleveland
Reliance Elec. & Engrg. Co., Cleveland
Wagner Electric Corp., St. Louis
Wesche Electric Co., B. A., Cincinnati
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

MOTORS, Geared (See **MOTORS, Electric**)

MOTORS, Hydraulic (see also **PUMPS, Hydraulic**)
Racine Tool & Mach. Co., Racine, Wis.
Sundstrand Mach. Tool Co., Rockford, Ill.

NAMEPLATES
Acromark Co., Elizabeth, N. J.
Matthews & Co., Jas. H., Pittsburgh
Noble & Westbrook Mfg. Co., Hartford, Conn.

NIBBLERS
Campbell, Andrew C., Div. Amer. Chain & Cable Co., Bridgeport, Conn.
Mitts & Merrill, Saginaw, Mich.
Savage Tool Co., Savage, Minn.

NOZZLES, Blast-Cleaning
Norton Company, Worcester, Mass.
Schrader's Sons, A., N. Y. C.

NUMBERING MACHINES (See **MARKING MACHINES**)

NUT-BLANKING MACHINES
Cleveland Automatic Mach. Co., Cleveland
National Acme Co., Cleveland
Potter & Johnston Machine Co., Pawtucket, R. I.

OIL STONES (See **STONES, Sharpening**)

OILERS, Automatic (See **LUBRICATING SYSTEMS**)

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Cities Service Co., N. Y. C.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Racine Tool & Mach. Co., Racine, Wis.
Shell Oil Co., Inc., N. Y. C.
Sinclair Refining Co., N. Y. C.
Socony-Vacuum Oil Co., N. Y. C.
Standard Oil Co. (Ind.), Chicago
Stuart Oil Co., D. A., Chicago
Sun Oil Co., Philadelphia
Texas Co., N. Y. C.
Tidewater Associated Oil Co., N. Y. C.
White & Bagley Co., Worcester, Mass.

OILS & GREASES (See **LUBRICANTS**)

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Cities Service Co., N. Y. C.
Gulf Oil Corp., Pittsburgh
Houghton & Co., E. F., Philadelphia
Shell Oil Co., Inc., N. Y. C.
Sinclair Refining Co., N. Y. C.
Socony-Vacuum Oil Co., N. Y. C.
Standard Oil Co. (Ind.), Chicago
Stuart Oil Co., D. A., Chicago
Sun Oil Co., Philadelphia
Texas Co., N. Y. C.
Tidewater Oil Co., N. Y. C.

PACKING, Hydraulic
Elmes Engrg. Wks., Chas. F., Chicago
Greene, Tweed & Co., N. Y. C.
Houghton & Co., E. F., Philadelphia
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Rhoads & Sons, J. E., Philadelphia
Watson-Stillman Co., Roselle, N. J.

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Sisalkraft Co., Chicago

PAPER & CLOTH, Abrasive
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Midwest Abrasive Co., Detroit

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Walker Co., O. S., Worcester, Mass.

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Bunting Brass & Bronze Co., Toledo
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Oster Mfg. Co., Cleveland
Peerless Machine Co., Racine, Wis.
Rickert-Shafer Co., Erie, Pa.
Scherr Co., Inc., Geo., N. Y. C.
Warner & Swasey Co., Cleveland

PLANERS
Cincinnati Planer Co., Cincinnati
The Cleveland Planer, Cleveland
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
General Machinery Corp., Hamilton, O.
Liberty Planers, Inc., Hamilton, O.
Ohio Machine Tool Co., Kenton, O.
Rockford Mach. Tool Co., Rockford, Ill.
Sellers & Co., Inc., Wm., Philadelphia

PLANERS, Plate
Baldwin-Southwark Corp., Philadelphia
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Mach. Tool Corp., Rochester, N. Y.
General Machinery Corp., Hamilton, O.
Ohio Machine Tool Co., Kenton, O.
Sellers & Co., Wm., Philadelphia

PLATES, Angle
Brown & Sharpe Mfg. Co., Providence, R. I.
Lombard Governor Corp., Ashland, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

PLATES, Surface
Baumbach Mfg. Co., E. A., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Challenge Machy. Co., Grand Haven, Mich
Delta Mfg. Co., Milwaukee
Lombard Governor Corp., Ashland, Mass.
Machine Products Corp., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Starrett Co., L. S., Athol, Mass.
Taft-Peirce Mfg. Co., Woonsocket, R. I.

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General Electric Co., Schenectady, N. Y.

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General Electric Co., Schenectady, N. Y.
Hones, Inc., Chas. A., Baldwin, N. Y.
Strong, Carlisle & Hammond Co., Cleveland
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

PRESSES, Arbor
American Broach & Machine Co., Ann Arbor, Mich.
Atlas Press Co., Kalamazoo, Mich.
Barnes Co., W. F. & John, Rockford, Ill.
Elmes Engrg. Wks., Chas. F., Chicago
Famco Machine Co., Racine, Wis.
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Lempco Products, Inc., Bedford, O.
Lucas Machine Tool Co., Cleveland
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Producto Machine Co., Bridgeport, Conn.
Sheldon Machine Co., Chicago
Tomkins-Johnson Co., Jackson, Mich.
Watson-Stillman Co., Roselle, N. J.
Wilson, K. R., Buffalo, N. Y.
Wright Mfg. Div., American Chain & Cable Co., York, Pa.

PRESSES, Crank (See PRESSES, Power)

PRESSES, Foot
Etna Machine Co., Toledo, O.
Famco Machine Co., Racine, Wis.
Ferracute Machine Co., Bridgeton, N. J.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Nilson Mach. Co., A. H., Bridgeport, Conn
V. & O. Press Co., Hudson, N. Y.

PRESSES, Forging
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Bethlehem Steel Co., Bethlehem, Pa.
Clearing Machine Corp., Chicago
Cleveland Punch & Shear Works Co., Cleveland
Elmes Engrg. Wks., Chas. F., Chicago
Hill Acme Co., Cleveland
Hydraulic Press Mfg. Co., Mt. Gilead, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Watson-Stillman Co., Roselle, N. J.
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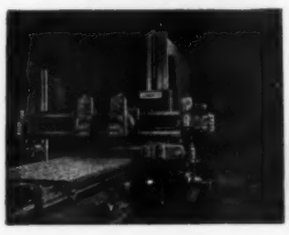

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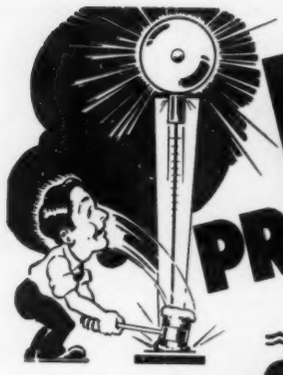

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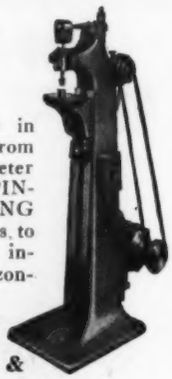

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Zeh & Hahnemann Co., Newark, N. J.

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Producto Mach. Co., Bridgeport, Conn.
Schatz Mfg. Co., Poughkeepsie, N. Y.
Wright Mfg. Div., American Chain & Cable Co., York, Pa.
Zeh & Hahnemann Co., Newark, N. J.

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
Nilson Mach. Co., A. H., Bridgeport, Conn.
Springfield Mach. Tool Co., Springfield, O.
Watson-Stillman Co., Roselle, N. J.

PRESSES, Turret Punch
Federal Press Co., Elkhart, Ind.
Wiedemann Machine Co., Philadelphia

PROFILERS (See **MILLERS, Vertical**)

PROJECTORS, Contour
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Portman Machine Tool Co., Mt. Vernon, N. Y.
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Ruthman Machinery Co., Cincinnati
Sundstrand Mach. Tool Co., Rockford, Ill.
Tomkins-Johnson Co., Jackson, Mich.
Tuthill Pump Co., Chicago

PUNCHES, Center & Hand (See **TOOLS, Hand**)

PURIFIERS, Oil & Coolant
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.

PYROMETERS, Indicating & Recording
Brown Instrument Co., Philadelphia

QUENCHERS
American Gas Furn. Co., Elizabeth, N. J.
Electric Furnace Co., Salem, O.
Farrel-Birmingham Co., Buffalo, N. Y.
Gleason Works, Rochester, N. Y.

RACKS, Gear (See **GEARS, Cut**)

RASPS (See **FILES & RASPS**)

RATCHETS (See **GEARS, Cut**)

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Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.

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Detroit Tap & Tool Co., Detroit
Gairing Tool Co., Detroit
Greenfield Tap & Die Corp., Greenfield, Mass.
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Oster Mfg. Co., Cleveland
Standard Tool Co., Cleveland
Torrington Co., Torrington, Conn.

REAMERS, Power
Catskill Metal Works, Catskill, N. Y.

REAMERS, Shell
Butterfield & Co., Derby Line, Vt.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Illinois Tool Works, Chicago
Morse Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Schultz & Anderson Co., Newark, N. J.
Union Twist Drill Co., Athol. Mass.

REAMERS, Solid
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Butterfield & Co., Derby Line, Vt.
Carboloy Co., Inc., Detroit
Cleveland Twist Drill Co., Cleveland
Detroit Tap & Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Greenfield Tap & Die Corp., Greenfield, Mass.
Haynes Stellite Co., N. Y. C.
Holman Reamer Co., Manchester, Conn.
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Tool Co., Cleveland
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Union Twist Drill Co., Athol, Mass.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Wendt Sonis Co., Hannibal, Mo.

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Barnes Co., W. F. & John, Rockford, Ill.
Cleveland Pneu. Tool Co., Cleveland
Rotor Tool Co., Cleveland
Van Norman Machine Tool Co., Springfield, Mass.

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RECORDERS, Temperature & Pressure
Brown Instrument Co., Philadelphia

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Meisel Press Mfg. Co., Boston, Mass.
Ohio Gear Co., Cleveland
Philadelphia Gear Works, Philadelphia
Reliance Elec. & Engrg. Co., Cleveland
Wagner Electric Corp., St. Louis
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

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Davis & Thompson Co., Milwaukee
Earle Gear & Machine Co., Philadelphia
Farrel-Birmingham Co., Buffalo, N. Y.
Ganschow Gear Co., Chicago
Gear Specialties, Inc., Chicago
General Electric Co., Schenectady, N. Y.
General Machinery Corp., Hamilton, O.
Grant Gear Works, Inc., Boston
Morse Chain Co., Ithaca, N. Y.
Ohio Gear Co., Cleveland
Philadelphia Gear Works, Philadelphia
Racine Tool & Mach. Co., Racine, Wis.
Stahl Gear & Machine Co., Cleveland
Sundstrand Mach. Tool Co., Rockford, Ill.
Watson-Stillman Co., Roselle, N. J.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

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Norton Co., Worcester, Mass.
Strong, Carlisle & Hammond Co., Cleveland

REGULATORS, Temperature
American Gas Furn. Co., Elizabeth, N. J.
Barber-Colman Co., Rockford, Ill.
Brown Instrument Co., Philadelphia

RIFLING MACHINES, Gun
American Broach & Machine Co., Ann Arbor, Mich.
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LeBlond Mach. Tool Co., R. K., Cincinnati
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.

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Number	Price Each	Fitting Size Reamer	Length Overall Inches	Morse Taper Shank
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RA7	4.30	1-5/16—1-21/32	11	3
RA8	4.80	1-11/16—2	12	4
RA9	5.40	2-1/16—2-1/2	13	4

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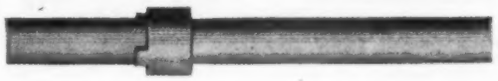

Number	Price Each	Fitting Size Reamer	Length Overall Inches
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RA7	3.60	1-5/16—1-21/32	11
RA8	4.00	1-11/16—2	12
RA9	4.50	2-1/16—2-1/2	13

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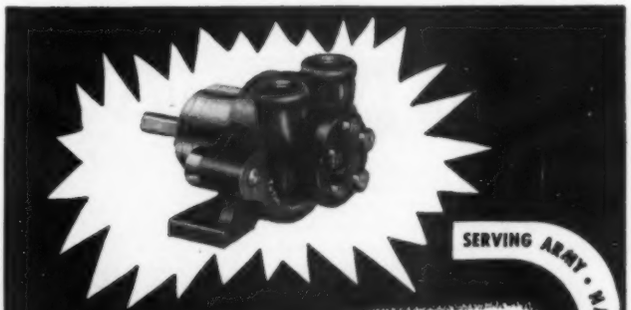

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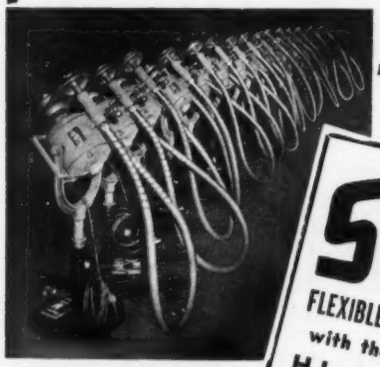

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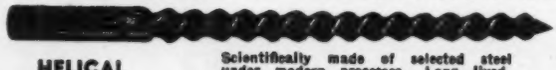

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Lamson & Sessions Co., Cleveland

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General Machinery Corp., Hamilton, O.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ryerson & Son, Inc., Jos. T., Chicago

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Ajax Mfg. Co., Cleveland
Bethlehem Steel Co., Bethlehem, Pa.

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Bethlehem Steel Co., Bethlehem, Pa.
Page Steel & Wire Div., Am. Chain & Cable Co., Monessen, Pa.
Roebling's Sons Co., John A., Trenton, N. J.
Ryerson & Son, Inc., Jos. T., Chicago

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Gorton Machine Co., Geo., Racine, Wis.
Knight Machy. Co., W. B., St. Louis
Onsrud Machine Works, Chicago
Reed-Prentice Corp., Worcester, Mass.

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Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Standard Tool Co., Cleveland

SAW BLADES, Hack & Band (See **BLADES, Hack & Band-Saw**)

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Delta Mfg. Co., Milwaukee
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Mattison Machine Works, Rockford, Ill.
Walker-Turner Co., Inc., Plainfield, N. J.

SAWS, Friction
Ryerson & Son, Inc., Jos. T., Chicago

SAWS, Hack (See **TOOLS, Hand**)

SAWS, Hole
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Atkins & Co., E. C., Indianapolis
Avey Drilling Mach. Co., Cincinnati
Black & Decker Mfg. Co., Towson, Md.
Earle Gear & Machine Co., Philadelphia
Schrader's Sons, A., N. Y. C.
Skilsaw, Inc., Chicago
Williams & Co., J. H., N. Y. C.

SAWS, Portable (See **TOOLS, Portable**)

SAWS, Power Hack
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Atkins & Co., E. C., Indianapolis
Capewell Mfg. Co., Hartford, Conn.
Covel Mfg. Co., Benton Harbor, Mich.
L-W Chuck Co., Toledo, Ohio
Oster Mfg. Co., Cleveland
Peerless Machine Co., Racine, Wis.
Racine Tool & Mach. Co., Racine, Wis.
Ryerson & Son, Inc., Jos. T., Chicago

SCRAPERS, Belt
Rhoads & Sons, J. E., Philadelphia

SCRAPERS, Hand (See **TOOLS, Hand**)

SCRAPERS, Power
Black & Decker Mfg. Co., Towson, Md.

SCREWDRIVERS, Flexible-Shaft (See **TOOLS, Flexible-Shaft**)

SCREWDRIVERS, Hand (See **TOOLS, Hand**)

SCREWDRIVERS, Portable Electric & Pneumatic (See **TOOLS, Portable**)

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Haskins Co., R. G., Chicago
Producto Machine Co., Bridgeport, Conn.
Schauer Machine Co., Cincinnati
Strand & Co., N. A., Chicago

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Cleveland Automatic Mach. Co., Cleveland
Cone Automatic Mach. Co., Windsor, Vt.
Foote-Burt Co., Cleveland
Greenlee Bros. & Co., Rockford, Ill.
National Acme Co., Cleveland
New Britain-Gridley Mach. Div., New Britain, Conn.
Scherr Co., Inc., George, N. Y. C.
Warner & Swasey Co., Cleveland

SCREW-MACHINES, Plain & Hand
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Automatic Mach. Co., Cleveland
Gisholt Machine Co., Madison, Wis.
Hardinge Brothers, Inc., Elmira, N. Y.
Jones & Lamson Mach. Co., Springfield, Vt.

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Rivett Lathe & Grinder, Inc., Boston
Warner & Swasey Co., Cleveland

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Baumbach Mfg. Co., E. A., Chicago
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Eastern Machine Screw Corp., New Haven, Conn.
Lamson & Sessions Co., Cleveland
National Acme Co., Cleveland
Parker-Kalon Corp., N. Y. C.
Republic Steel Corp., Cleveland, O.
Standard Pressed Steel Co., Jenkintown, Pa.
Strong, Carlisle & Hammond Co., Cleveland

SCREWS, Machine
Allen Mfg. Co., Hartford, Conn.
Eastern Machine Screw Corp., New Haven, Conn.
Lamson & Sessions Co., Cleveland
Republic Steel Co., Cleveland
Strong, Carlisle & Hammond Co., Cleveland

SCREWS, Recessed Head
American Screw Co., Providence, R. I.
Central Screw Co., Chicago
Chandler Products Corp., Cleveland
Continental Screw Co., New Bedford, Mass.
Corbin Screw Corp., New Britain, Conn.
International Screw Co., Detroit
Lamson & Sessions Co., Cleveland
National Screw & Mfg. Co., Cleveland
New England Screw Co., Keene, N. H.
Parker Co., Charles, Meriden, Conn.
Parker-Kalon Corp., N. Y. C.
Pawtucket Screw Co., Pawtucket, R. I.
Pheoll Mfg. Co., Chicago, Ill.
Phillips Screw Mfrs., Providence, R. I.
Russell, Burdsall & Ward Bolt & Nut Co., Port Chester, N. Y.
Scovill Mfg. Co., Waterbury, Conn.
Shakeproof Lock Washer Co., Chicago
Southington Hardware Mfg. Co., Southington, Conn.
Standard Pressed Steel Co., Jenkintown, Pa.
Whitney Screw Corp., Nashua, N. H.

SCREWS, Self-Tapping
Parker-Kalon Corp., N. Y. C.

SCREWS, Thumb & Wing
Parker-Kalon Corp., N. Y. C.
Williams & Co., J. H., N. Y. C.

SCRIBERS
Brown & Sharpe Mfg. Co., Providence, R. I.
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

SEALS, Oil
Gits Bros. Mfg. Co., Chicago

SEPARATORS, Centrifugal
Barrett Co., Leon J., Worcester, Mass.
DeLaval Separator Co., N. Y. C.
National Acme Co., Cleveland

SETS, Rivet
American Swiss File & Tool Co., Elizabeth, N. J.
Bethlehem Steel Co., Bethlehem, Pa.
Cleveland Punch & Shear Works Co., Cleveland

SETTERS, Nut (See **TOOLS, Portable**)

SHAFTING, Steel
Bethlehem Steel Co., Bethlehem, Pa.
Earle Gear & Mach. Co., Philadelphia
Jones & Laughlin Steel Corp., Pittsburgh
National Tube Co., Pittsburgh
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Union Drawn Steel Co., Massillon, O.
Wyckoff Drawn Steel Co., Pittsburgh

SHAFTS, Flexible
Dumore Co., Racine, Wis.
Errington Mech. Lab., Stapleton, N. Y.
Haskins Co., R. G., Chicago
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Stow Mfg. Co., Binghamton, N. Y.
Strand Co., N. A., Chicago
Walker-Turner Co., Inc., Plainfield, N. J.

SHAPERS
American Tool Works Co., Cincinnati
Ames Co., B. C., Waltham, Mass.
Atkins & Co., E. C., Indianapolis
Atlas Press Co., Kalamazoo, Mich.
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Bryant Machinery & Engrg. Co., Chicago
Cincinnati Shaper Co., Cincinnati
Hanson-Whitney Mach. Co., Hartford Conn.
Hendey Machine Co., Torrington, Conn.
Machinery Mfg. Co., Los Angeles
Morey Machinery Co., Inc., N. Y. C.
Ohio Machine Tool Co., Kenton, O.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Reed-Prentice Corp., Worcester, Mass.
Rockford Mach. Tool Co., Rockford, Ill.
Smith & Mills Co., Cincinnati

SHARPENERS, Saw
Detroit Tap & Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Fellows Gear Shaper Co., Springfield, Vt.
Mead Specialties Co., Chicago
Michigan Tool Co., Detroit
National Broach & Mach. Co., Detroit
Weldon Tool Co., Cleveland

SHAVING MACHINES
Consolidated Machine Tool Corp., Rochester, N. Y.
Cross Gear & Machine Co., Detroit
Michigan Tool Co., Detroit

SHEARS, Hand
Black & Decker Mfg. Co., Towson, Md.
Buffalo Forge Co., Buffalo, N. Y.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
O'Neil-Irwin Mfg. Co., Minneapolis

SHEARS, Rotary
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Detroit Tap & Tool Co., Detroit
Disston & Sons, Inc., Henry, Tacony, Philadelphia
Illinois Tool Works, Chicago
Michigan Tool Co., Detroit
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Ryerson & Son, Inc., Jos. T., Chicago
Schatz Mfg. Co., Poughkeepsie, N. Y.

SHEARS, Squaring
Beatty Mach. & Mfg. Co., Hammond, Ind.
Buffalo Forge Co., Buffalo, N. Y.
Cincinnati Shaper Co., Cincinnati
Cleveland Crane & Engrg. Co., Wickliffe, O.
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Kent-Owens Machine Co., Toledo, O.
Mitts & Merrill, Saginaw, Mich.
Niagara Mach. & Tool Wks., Buffalo, N. Y.
Schatz Mfg. Co., Poughkeepsie, N. Y.

SHEAVES, "V" Belt
Allis-Chalmers Mfg. Co., Milwaukee
American Pulley Co., Philadelphia
Dayton Rubber Mfg. Co., Dayton, O.
Earle Gear & Machine Co., Philadelphia
Gates Rubber Co., Denver, Colo.
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SHELL-MAKING Machinery
Bullard Co., Bridgeport, Conn.
Hepburn American Co., Greenwich, Conn.
Morey Machinery Co., Inc., N. Y. C.

SKIDS (See **TRUCKS, Hand**)

SLEEVES & SOCKETS, Drill
Armstrong Bros. Tool Co., Chicago
Brown & Sharpe Mfg. Co., Providence, R. I.
Cleveland Twist Drill Co., Cleveland
Greenfield Tap & Die Corp., Greenfield, Mass.
Hardinge Brothers, Inc., Elmira, N. Y.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Standard Tool Co., Cleveland
Union Twist Drill Co., Athol, Mass.

SLOTTERS
Baker Bros., Inc., Toledo, O.
Consolidated Machine Tool Corp., Rochester, N. Y.
Douglas Machinery Co., Inc., N. Y. C.
General Machinery Corp., Hamilton, O.
Greenfield Tap & Die Corp., Greenfield, Mass.

SOCKETS, Drill (See **SLEEVES & SOCKETS, Drill**)

SOLVENTS, Oil & Grease
Detroit Rex Products Co., Detroit
Oakite Products, Inc., N. Y. C.

SPINDLES, Machine
Bryant Chucking Grinder Co., Springfield, Vt.
Dumore Co., Racine, Wis.
Ex-Cell-O Corp., Detroit
Heald Machine Co., Worcester, Mass.
Monarch Machine Tool Co., Sidney, O.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago

SPRAYERS, Paint
Ideal Commutator Dresser Co., Chicago

SPRINGS, Die
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Danly Machine Specialties, Chicago

SPROCKETS (See **GEARS, Cut**)

SQUARES, Precision (See **BLOCKS, Precision Gage**)

STAMPINGS, Metal
Acromark Corp., Elizabeth, N. J.
American Brass Co., Waterbury, Conn.
Continental Machines, Inc., Minneapolis
Revere Copper & Brass Inc., N. Y. C.
Standard Pressed Steel Co., Jenkintown, Pa.
Sundstrand Mach. Tool Co., Rockford, Ill.

STAMPS & HOLDERS, Steel, Safety
Acromark Corp., Elizabeth, N. J.
Cunningham Co., M. E., Pittsburgh
Moore Mfg. Co., Wm., Chicago
Noble & Westbrook Mfg. Co., East Hartford, Conn.

STAMPS, Steel (See **DIES, Marking & Embossing**)

STARTERS, Motor (See **CONTROLLERS, Motor**)

STEEL, Die
Allegheny Ludlum Steel Corp., Pittsburgh
Bethlehem Steel Co., Bethlehem, Pa.
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Firth-Sterling Steel Co., McKeesport, Pa.
Latrobe Electric Steel Co., Latrobe, Pa.
Ryerson & Son, Inc., Jos. T., Chicago
Timken Steel & Tube, Div., Canton, O.
Vanadium Alloys Steel Co., Pittsburgh

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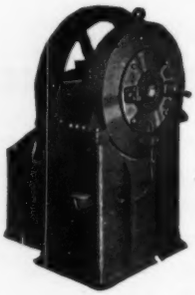

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Columbia Steel Co., San Francisco
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Disston & Sons, Inc., Henry, Philadelphia
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc. Div. Borg-Warner Corp., New Castle, Ind.
Jones & Laughlin Steel Corp., Pittsburgh
Latrobe Elec. Steel Co., Latrobe, Pa.
Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Timken Steel & Tube Div., Canton, O.
Union Drawn Steel Co., Massillon, O. (Cold-finished)
Vanadium Alloys Steel Co., Pittsburgh
Wheelock, Lovejoy & Co., Inc., Cambridge, Mass.
Wyckoff Drawn Steel Co., Pittsburgh

STEEL, Stainless (See preceding classification)

STEEL, Tool
Allegheny-Ludlum Steel Corp., Pittsburgh
Armstrong Bros. Tool Co., Chicago
Bethlehem Steel Co., Bethlehem, Pa.
Carnegie-Illinois Steel Corp., Pittsburgh
Carpenter Steel Co., Reading, Pa.
Cleveland Twist Drill Co., Cleveland
Climax Molybdenum Co., N. Y. C.
Columbia Steel Co., San Francisco
Copperweld Steel Co., Glassport, Pa.
Firth-Sterling Steel Co., McKeesport, Pa.
Ingersoll Steel & Disc. Div. Borg-Warner Corp., New Castle, Ind.
Latrobe Elec. Steel Co., Latrobe, Pa.
Republic Steel Corp., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Scully Steel Products Co., N. Y. C.
Timken Steel & Tube Div., Canton, O.
United States Steel Corp., Pittsburgh
Vanadium Alloys Steel Co., Pittsburgh
Wheelock, Lovejoy Co., Inc., Cambridge, Mass.

STERILIZERS, Oil
Barrett Co., Leon J., Worcester, Mass.

STOCKS, Dies & Cutters, Pipe
Armstrong Bros. Tool Co., Chicago
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Greenfield Tap & Die Corp., Greenfield, Mass.
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Oster Mfg. Co., Cleveland
Pratt & Whitney Co., Div. Niles-Bement-Pond Co., Hartford, Conn.
Sheffield Corp., Dayton, O.
Standard Tool Co., Cleveland

STONES, Sharpening
Bay State Abrasive Products Co., Westboro, Mass.
Behr-Manning Corp., Troy, N. Y.
Carborundum Co., Niagara Falls, N. Y.
Midwest Abrasive Co., Detroit

STRAIGHTEDGES (See DIE-MAKERS' SUPPLIES)

STRAIGHTENERS, Wire
Cleveland Punch & Shear Works Co., Cleveland
Consolidated Machine Tool Corp., Rochester, N. Y.
Springfield Mach. Tool Co., Springfield, O.
Watson-Stillman Co., Roselle, N. J.

STRAIGHTENING & SIZING MACHINES
Taylor Wilson Mfg. Co., McKees Rocks, Pa.

STRIPPERS, Wire
Ideal Commutator Dresser Co., Chicago

SUB-PRESSES & DIES (See Dies, Sub-press)

SUPERFINISHING EQUIPMENT
Ultra-Lap Mach. Co., Detroit

SURFACE-BROACHING MACHINES (See BROACHING MACHINES)

SURFACE PLATES (See PLATES, Surface)

SWAGING MACHINES
Etna Machine Co., Toledo
Hardinge Brothers, Inc., Elmira, N. Y.
Torrington Co., Torrington, Conn.

SWITCHES, Electric
Adam Electric Co., Frank, St. Louis
Allen-Bradley Co., Milwaukee
Allis-Chalmers Mfg. Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Brown Instrument Co., Philadelphia
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
L-W Chuck Co., Toledo, O.
Square D Co., Milwaukee
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

SWITCHES, Limit
Adam Electric Co., Frank, St. Louis
Allen-Bradley Co., Milwaukee
Barber-Colman Co., Rockford, Ill.
Clark Controller Co., Cleveland
General Electric Co., Schenectady, N. Y.
National Acme Co., Cleveland
Square D Co., Milwaukee
Westinghouse Electric & Mfg. Co., E. Pittsburgh, Pa.

SYSTEMS, Production & Tool Control
McCaskey Register Co., Alliance, O.

TABLES, Elevating Portable
Hamilton Tool Co., Hamilton, O.

TACHOMETERS (See INDICATORS, Speed)

TANKS & CYLINDERS, Air
Anker Holth Mfg. Co. (Airgrip Chuck Div.), Port Huron, Mich.
Clearing Machine Corp., Chicago
Curtis Pneu. Machinery Co., St. Louis
National Tube Co., Pittsburgh
Tomkins-Johnson Co., Jackson, Mich.

TAPER PINS (See PINS, Dowel & Taper)

TAPES, Measuring
Lufkin Rule Co., Saginaw, Mich.
Starrett Co., L. S., Athol, Mass.

TAPPERS, Single & Multi-Spindle
Armstrong-Blum Mfg. Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Avey Drilling Machine Co., Cincinnati
Baker Bros., Inc., Toledo, O.
Barber-Colman Co., Rockford, Ill.
Barnes Drill Co., Rockford, Ill.
Barnes Co., W. F. & John, Rockford, Ill.
Baush Mach. Tool Co., Springfield, Mass.
Bodine Corp., Bridgeport, Conn.
Bradford Mach. Tool Co., Cincinnati
Buffalo Forge Co., Buffalo, N. Y.
Buhr Mach. Tool Co., Ann Arbor, Mich.
Bullard Co., Bridgeport, Conn.
Cincinnati Bickford Tool Co., Cincinnati
Cincinnati-Gilbert Machine Tool Co., Cincinnati
Delta Mfg. Co., Milwaukee
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Geometric Tool Co., New Haven, Conn.
Goss & deLeeuw Machine Co., New Britain, Conn.
Greenlee Bros. & Co., Rockford, Ill.
Hamilton Tool Co., Hamilton, O.
Haskins Co., R. G. Chicago
Hill Acme Co., Cleveland
Kingsbury Mach. Tool Corp., Keene, N. H.
Leland-Gifford Co., Worcester, Mass.
Moline Tool Co., Moline, Ind.
Murchey Mach. & Tool Co., Detroit
National Acme Co., Cleveland
National Auto. Tool Co., Richmond, Ind.
Rickert-Shafer Co., Erie, Pa.
Snyder Tool & Engrg. Co., Detroit

TAPS, Adjustable (See DIES, Adjustable)

TAPS, Hand & Machine, Solid
Butterfield & Co., Derby Line, Vt.
Card Mfg. Co., S. W., Mansfield, Mass.
Detroit Tap & Tool Co., Detroit
Geometric Tool Co., New Haven, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hanson-Whitney Machine Co., Hartford, Conn.
Landis Machine Co., Waynesboro, Pa.
Michigan Tool Co., Detroit
Morse Twist Drill & Machine Co., New Bedford, Mass.
Murchey Machine & Tool Co., Detroit
National Twist Drill & Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Rickert-Shafer Co., Erie, Pa.
Standard Tool Co., Cleveland
Threadwell Tap & Die Co., Greenfield, Mass.
Union Twist Drill Co., Athol, Mass.

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Excello Corp., Detroit
Geometric Tool Co., New Haven, Conn.
Grant Mfg. & Machine Co., Bridgeport, Conn.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hill Acme Co., Cleveland
Lees-Bradner Co., Cleveland
Murchey Machine & Tool Co., Detroit
Oster Mfg. Co., Cleveland
Rickert-Shafer Co., Erie, Pa.
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Waltham Mach. Wks., Waltham, Mass.
Warner & Swasey Co., Cleveland

THREADING MACHINES, Roll
Brown & Sharpe Mfg. Co., Providence, R. I.
Hill Acme Co., Cleveland
V. & O. Press Co., Hudson, N. Y.

THERMOMETERS, Dial
Brown Instrument Co., Philadelphia
Strong, Carlisle & Hammond Co., Cleveland

TOOL HOLDERS (See **HOLDERS, Tool**)

TOOL POSTS, Lathe
Armstrong Bros. Tool Co., Chicago
Detroit Tap & Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Hendey Machine Co., Torrington, Conn.
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Williams & Co., J. H., N. Y. C.

TOOLS, Boring
Armstrong Bros. Tool Co., Chicago
Bullard Co., Bridgeport, Conn.
Carboloy Co., Detroit, Mich.
Cincinnati Lathe & Tool Co., Cincinnati
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Heald Machine Co., Worcester, Mass.
Illinois Tool Works, Chicago
Lucas Machine Tool Co., Cleveland
McCrosky Tool Corp., Meadville, Pa.
Michigan Tool Co., Detroit
National Tool Co., Cleveland
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Ready Tool Co., Bridgeport, Conn.
Scully-Jones & Co., Chicago
Sturdimatic Tool Co., Detroit
Taft-Peirce Mfg. Co., Woonsocket, R. I.
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., N. Y. C.

TOOLS and PARTS, Cemented-Carbide
Armstrong Bros. Tool Co., Chicago
Barber-Colman Co., Rockford, Ill.
Carboloy Co., Inc., Detroit
Crafts Co. Inc., Arthur A., Boston
Detroit Tap & Tool Co., Detroit
Disston and Sons, Inc., Henry, Tacony, Philadelphia
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gairing Tool Co., Detroit
Illinois Tool Works, Chicago
McKenna Metals Co., Latrobe, Pa.
Metal Carbides Corp., Youngstown, O.
Michigan Tool Co., Detroit
Morse Twist Drill & Mach. Co., New Bedford, Mass.
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Scully-Jones & Co., Chicago
Sheffield Corp., Dayton, O.
Tungsten Elec. Corp., Union City, N. J.
Vanadium Alloys Steel Co., Pittsburgh
Vascoloy-Ramet Corp., Chicago
Warner & Swasey Co., Cleveland
Wendt Sonis Co., Hannibal, Mo.
Williams & Co., J. H., Buffalo, N. Y.

TOOLS, Diamond-Tipped
Crafts Co., Arthur A., Boston
Desmond-Stephan Mfg. Co., Urbana, O.
Diamond Tool Co., Chicago
Gorton Machine Co., Geo., Racine, Wis.
Kent-Owens Machine Co., Toledo, O.
Koebel Diamond Tool Co., Detroit
Norton Company, Worcester, Mass.
Smit & Son, J. K., N. Y. C.

TOOLS, Flexible-Shaft
Dumore Co., Racine, Wis.
Haskins Co., R. G., Chicago
Ideal Commutator Dresser Co., Chicago
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Stow Mfg. Co., Binghamton, N. Y.
Strand & Co., N. A., Chicago
Walker-Turner, Inc., Plainfield, N. J.

TOOLS, Hand
Allen Mfg. Co., Hartford, Conn.
American Swiss File & Tool Co., Elizabeth, N. J.
Armstrong-Blum Mfg. Co., Chicago
Armstrong Bros. Tool Co., Chicago
Atkins & Co., F. C., Indianapolis
Automotive Maintenance Machy. Co., No. Chicago, Ill.
Brown & Sharpe Mfg. Co., Providence, R. I.
Butterfield & Co., Derby Line, Vt.
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Carboloy Co., Detroit
Card Mfg. Co., S. W., Mansfield, Mass.
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Cleveland Twist Drill Co., Cleveland
Crafts Co., Arthur A., Boston
Dearborn Gage Co., Dearborn, Mich.
Disston & Sons, Inc., Henry, Philadelphia
Elastic Stop Nut Corp., Union, N. J.
Errington Mech. Lab., Stapleton, N. Y.
Gairing Tool Co., Detroit
Greene, Tweed & Co., N. Y. C.
Greenfield Tap & Die Corp., Greenfield, Mass.
Hamilton Tool Co., Hamilton, O.
Lufkin Rule Co., Saginaw, Mich.
National Twist Drill & Tool Co., Detroit
Niagara Mach. & Tool Wks., Buffalo, N. Y.
North Bros. Mfg. Co., Philadelphia
Numberall Stamp & Tool Co., Huguenot Park, N. Y.
Plomb Tool Co., Los Angeles
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Racine Tool & Mach. Co., Racine, Wis.
Scully-Jones & Co., Chicago
Slocomb Co., J. T., Providence, R. I.
Standard Tool Co., Cleveland
Thompson & Son Co., Henry G., New Haven, Conn.
Union Twist Drill Co., Athol, Mass.
Victor Saw Works, Inc., Middletown, N. Y.
Williams & Co., J. H., N. Y. C.

TOOLS, Knurling (See **Knurls & Knurl Holders**)

TOOLS, Lathe, Shaper and Planer
American Tool Works Co., Cincinnati
Armstrong Bros. Tool Co., Chicago
Atlas Press Co., Kalamazoo, Mich.
Auto Ordnance Corp., Bridgeport, Conn.
Blake Co., Edward, Newton Centre, Mass.
Bullard Co., Bridgeport, Conn.
Carboloy Co., Detroit
Cincinnati Lathe & Tool Co., Cincinnati
Cleveland Twist Drill Co., Cleveland
Empire Tool Co., Detroit
Ex-Cell-O Corp., Detroit
Firth-Sterling Steel Co., McKeesport, Pa.
Gisholt Machine Co., Madison, Wis.
Haynes Stellite Co., N. Y. C.
Hendey Machine Co., Torrington, Conn.
Illinois Tool Works, Chicago
Jefferson Mach. Tool Co., Cincinnati
LeBlond Mach. Tool Co., R. K., Cincinnati
McKenna Metals Co., Latrobe, Pa.
Michigan Tool Co., Detroit
National Broach & Machine Co., Detroit
National Tool Co., Cleveland
Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Ready Tool Co., Bridgeport, Conn.
Rivett Lathe & Grinder, Inc., Boston
Scully-Jones & Co., Chicago
Starrett Co., L. S., Athol, Mass.
Sturdimatic Tool Co., Detroit
Vascoloy-Ramet Corp., N. Chicago, Ill.
Warner & Swasey Co., Cleveland
Williams & Co., J. H., N. Y. C.

TOOLS, Portable Electric
Black & Decker Mfg. Co., Towson, Md.
Chicago Wheel & Mfg. Co., Chicago
Delta Mfg. Co., Milwaukee
Dremel Mfg. Co., Racine, Wis.
Dumore Co., Racine, Wis.
Foredom Electric Co., N. Y. C.
Rotor Tool Co., Cleveland
Schauer Machine Co., Cincinnati
Skilsaw, Inc., Chicago
Walker-Turner Co., Plainfield, N. J.

TOOLS, Portable Pneumatic
Cleveland Pneu. Tool Co., Cleveland
Onsrud Machine Works, Inc., Chicago
Rotor Tool Co., Cleveland
Sheldon Machine Co., Chicago

TOOLS, Stellite
Haynes Stellite Co., N. Y. C.

TORCHES, Gas-Cutting & Welding
Air Reduction, N. Y. C.

TRANSMISSIONS, Hydraulic
American Engrg. Co., Philadelphia
Barnes Co., W. F. & John, Rockford, Ill.
Elmes Engrg. Wks., Chas. F., Chicago
Ex-Cell-O Corp., Detroit
Sundstrand Mach. Tool Co., Rockford, Ill.

TRANSMISSIONS, Mech. Variable-Speed
Allis-Chalmers Mfg. Co., Milwaukee
Continental Machines, Inc., Minneapolis
Earle Gear & Machine Co., Philadelphia
Ideal Commutator Dresser Co., Chicago
Morse Chain Co., Ithaca, N. Y.
Reeves Pulley Co., Columbus, Ind.
Westinghouse Elec. & Mfg. Co., E. Pittsburgh

TROLLEYS, TRACKS & TRAMWAYS, Overhead
American Steel & Wire Co., Cleveland
Chisholm-Moore Hoist Corp., Tonawanda, N. Y.
Cleveland Crane & Engineering Co., Wickliffe, O.
Cullen-Friestedt Co., Chicago
Curtis Pneu. Machinery Co., St. Louis
Ford Chain Block Div. Am. Chain & Cable Co., Inc., Philadelphia, Pa.
Harnischfeger Corp., Milwaukee
Mathews Conveyer Co., Ellwood City, Pa.
Standard Conveyor Co., No. St. Paul, Minn.
Wright Mfg. Div. Am. Chain & Cable Co., Inc., York, Pa.

TRUCKS, Hand
Standard Pressed Steel Co., Jenkintown, Pa.

TUBING, Steel
Bissett Steel Co., Cleveland
Ryerson & Son, Inc., Jos. T., Chicago
Timken Steel & Tube Co., Canton, Ohio

TURRETS, Tool-post & Tailstock
Gisholt Machine Co., Madison, Wis.
Jefferson Machine Tool Co., Cincinnati
McCrosky Tool Corp., Meadville, Pa.
Warner & Swasey Co., Cleveland

UNITS, Drilling, Reaming & Tapping
Barnes Co., W. F. & John, Rockford, Ill.
Kingsbury Mach. Tool Corp., Keene, N. H.

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USED MACHINERY (See **Searchlight Section**)

V BLOCKS (See **Blocks, V**)

VALVES, Air-Control
Atkins & Co., E. C., Indianapolis
Barber-Colman Co., Rockford, Ill.
Curtis Pneu. Machinery Co., St. Louis
Nicholson & Co., W. H., Wilkes-Barre, Pa.
Ross Operating Valve Co., Detroit
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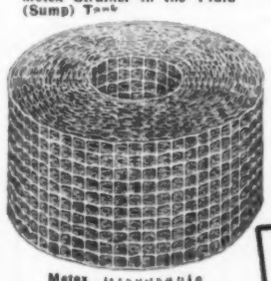

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Pratt & Whitney Div., Niles-Bement-Pond Co., Hartford, Conn.
Producto Mach. Co., Bridgeport, Conn.
Williams & Co., J. H., N. Y. C.

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Lincoln Electric Co., Cleveland
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Ohio Machine Tool Co., Kenton, O.

WELDERS, Spot
Ohio Machine Tool Co., Kenton, O.
Progressive Welder Co., Detroit

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Hobart Bros. Co., Troy, O.
Lincoln Electric Co., Cleveland
McKay Co., Pittsburgh
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Ryerson & Son, Inc., Jos. T., Chicago
Westinghouse Elec. & Mfg. Co., E. Pittsburgh, Pa.

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Lincoln Electric Co., Cleveland

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Macklin Co., Jackson, Mich.
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Porter-Cable Mach. Co., Syracuse, N. Y.
Roberts Rubber Co., Weldon, Newark, N. J.
Sterling Grinding Wheel Co., Tiffin, O.
Vitrified Wheel Co., Westfield, Mass.

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Ideal Commutator Dresser Co., Chicago

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Armstrong Bros. Tool Co., Chicago
Standard Tool Co., Cleveland
Williams & Co., J. H., N. Y. C.

WRENCHES, Socket
Armstrong Bros. Tool Co., Chicago
Greene, Tweed & Co., N. Y. C.
Plomb Tool Co., Los Angeles
Williams & Co., J. H., N. Y. C.

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Card Mfg. Co., S. W., Mansfield, Mass.
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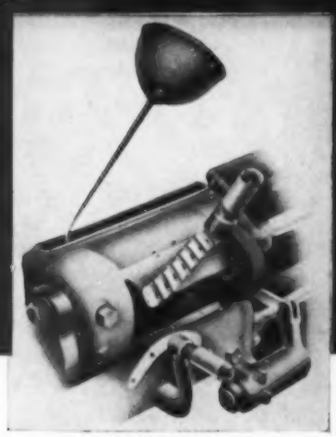

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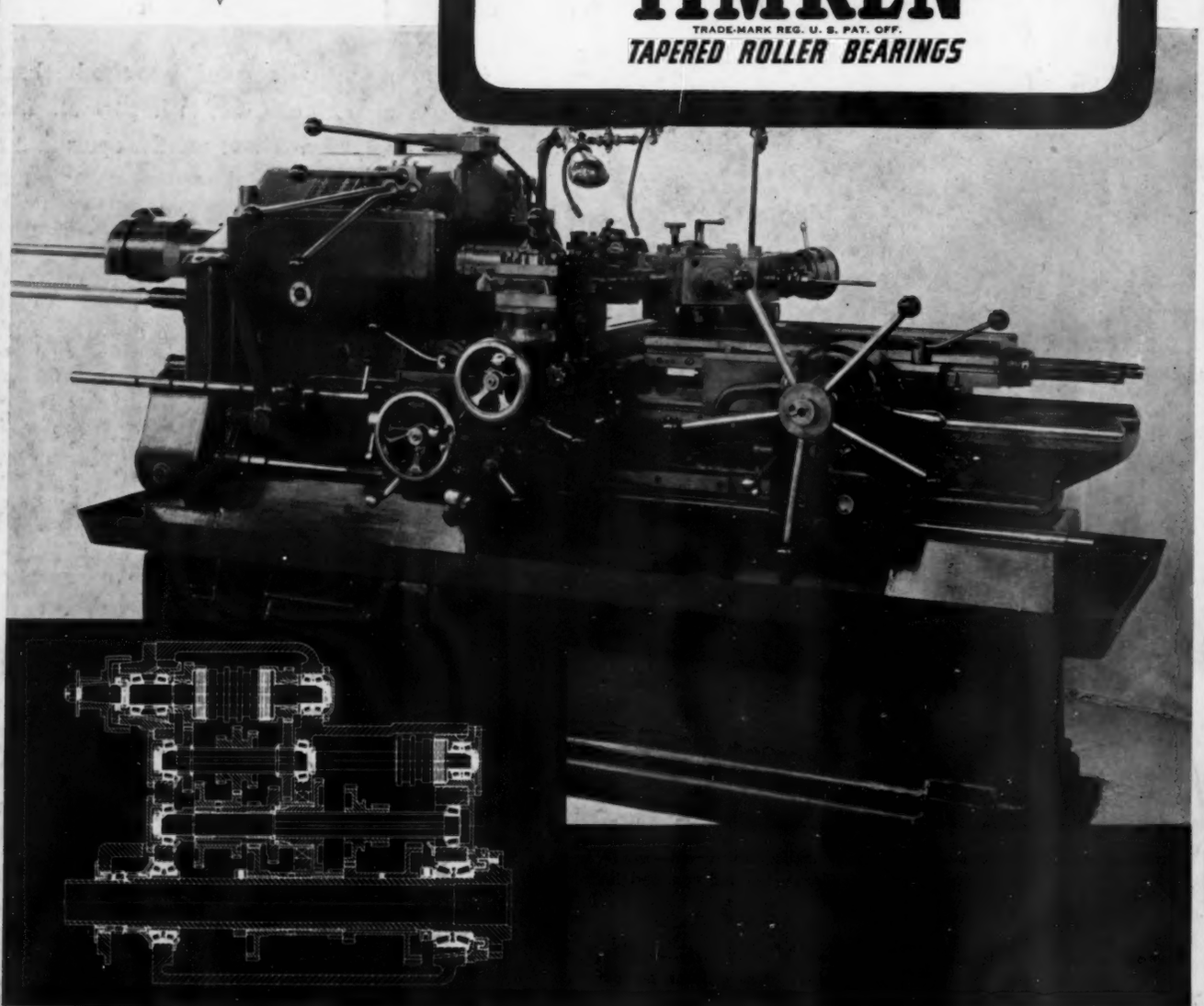
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